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ABSTRACT

This study was concerned with two things: (1) to determine whether a generally accepted definition of environmental education was extant; and (2) to determine whether a generally accepted substantive structure of environmental education was extant. It was determined that no single generally accepted definition was extant. The key words and phrases used most frequently were synthesized into a mediating definition of environmental education. It was also determined that a generally accepted substantive structure for environmental education was not extant in the literature. It was the author's opinion that a structure could be constructed utilizing the components of philosophy, precept, and expected outcome. Criticisms of the past literature were identified. Paradigms were designed to illustrate the structures identified. (RH)

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Environmental Education:
A Delineation of Substantive Structure

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by

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BA Harris Teachers College, 1966

MS Ed Southern Illinois University, 1971

A Dissertation Submitted in Partial
Fulfillment of the Requirements for
the Doctor of Philosophy Degree

Department of Curriculum, Instruction, and Media
in the Graduate School
Southern Illinois University
August 1976

SE 021 924

AN ABSTRACT OF THE DISSERTATION OF

Gary D. Harvey, for the Doctor of Philosophy degree in Education, presented on July 28, 1976, at Southern Illinois University at Carbondale.

TITLE: Environmental Education: A Delineation of Substantive Structure

Major Professor: Dr. Harold R. Hungerford

There are two areas of concern in this dissertation: (1) to determine whether a generally accepted definition of environmental education was extant; and (2) to determine whether a generally accepted substantive structure of environmental education was extant. The research questions stated that a mediating definition and/or substantive structure would be constructed if they were not extant in a generally accepted form.

The researcher reviewed the history and background of environmental education in order to provide a historical context for the remainder of the study.

Definitions of environmental education were compiled and arranged by year of publication. It was determined that no single generally accepted definition was extant. Key words and phrases were identified in each cited definition and tallied. The most often used key words and phrases were synthesized into a mediating definition of environmental education.

Attempts to identify and delineate the substantive structure of environmental education identified in the professional literature were

compiled in five categories or approaches: position papers, paradigms, concept lists and curricula, course(s) approach, and supplemental and other approaches. After an extensive review, it was determined that a generally accepted substantive structure for environmental education was not extant in the literature.

Key words and phrases were identified in the approaches and tallied to indicate relative use by writers in the field. A review of the key words and phrases led the researcher to the conclusion that a generic substantive structure of environmental education could be constructed by utilizing three basic components which encompass many of the others. The components are philosophy, precept, and expected outcome.

The philosophy (or first major component) was perceived to be "Spaceship Earth" with a "lifeboat" concept frame of reference. "Spaceship Earth" utilizes man, environment, and relationship as major components while the "lifeboat" concept provides a values/ethical orientation.

The precept (man-environment relationship), or second major component, operating in a values context, is perceived to operationalize the philosophy and lead to expected outcomes. The researcher perceived, and resolved, four areas of inconsistency or incompleteness in the literature. The first such area relates to the discrepancy between the name "environmental education" and the references to "man-environment relationship." The researcher concluded that "environmental education" is a misnomer and that consistency with the literature dictated the use of "man-environment relationship education" or "MERE" instead of "environmental education" as the name for this area of study. (The researcher suggested the use of the parallel terminology "people-environment relationship education" or "PERE" in his recommendations.)

Two criteria were established to discriminate between MERE (i.e., "environmental education") and non-MERE topics. This led the researcher to the second area of inconsistency or incompleteness in the literature, i.e., MERE and non-MERE topics are intermixed in the "environmental education" literature. Many of these non-MERE topics were perceived to be prerequisite, or complementary, to MERE and were termed man-environment relationship foundations or MERF. (In his recommendations, the researcher suggested the parallel terminology "people-environment relationship foundations" or "PERF.")

A third perceived area of inconsistency was the interchangeable use of the terms multidisciplinary and interdisciplinary. These two terms were defined and MERE (i.e., "environmental education") was determined to be interdisciplinary while MERF could be disciplinary, multidisciplinary, or interdisciplinary.

A fourth area of incompleteness was perceived in the area of expected outcome, or the third major component of substantive structure of "environmental education." The expected outcome most often expressed in the literature, environmental literacy, was perceived to be inadequate to describe the totality of expected outcomes for "environmental education" as conceptualized in this study. The researcher proposed and operationalized two additional levels of expected outcome, environmental competence, and environmental dedication.

The three components (philosophy, precept, and expected outcome) were combined into a paradigm (Figure 57) of the generic substantive structure of "environmental education." This was followed by a paradigm which included references to specific substantive structure components

beyond the scope of the study. The second paradigm (Figure 58) represents the researcher's conceptualization of the substantive structure of "environmental education." A final paradigm (Figure 59) combines the substantive structure with its more generic bases.

Conclusions, implications and recommendations were made. The major recommendation is application of the substantive structure of "environmental education" to theory and practice.

SIU

Dissertation Approval

The Graduate School
Southern Illinois
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July 28, 19 76

I hereby recommend that the dissertation prepared under my supervision by

Gary D. Harvey

Entitled

Environmental Education: A Delineation of Substantive Structure

be accepted in partial fulfillment of the requirements for the

DOCTOR OF PHILOSOPHY degree.

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Committee
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Final Examination

Environmental Education:

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Department of Curriculum, Instruction, and Media
in the Graduate School
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August 1976

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Dissertation Title:

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Major Professor: Dr. Harold R. Hungerford

Publications:

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Chapter I

INTRODUCTION TO THE STUDY

> There is no question that men must learn to live ecologically responsible lives. There is no alternative. We have no easy out through politics. We cannot protect our environment through legal means alone. It is not even a question of first trying educational means to persuade people to live responsible lives. EE must succeed, for education has always been and must always be the instrument of constructive, evolutionary change in a free society. (Department of Health, Education and Welfare, n.d.)

One needs to spend only a relatively brief time reading, listening, or observing to come to the conclusion that the human race is in the midst of an environmental situation many feel attains crisis proportions. While there is debate over the breadth and depth of the various situations, there is considerable documentation concerning the existence of many serious environmental problems (Allen, 1970; Brubaker, 1972; Clay, 1971; Committee on Resources and Man, 1969; Commoner, 1971; DeBell, 1970; Ehrlich & Ehrlich, 1970; Fortune, 1970; Helfrich, 1970, 1971; Johnson, 1970; Mason & Folkerts, 1973; Meadows, Meadows, Randers & Behrens, 1972; Osborn, 1948; Smith, Steck & Surette, 1974; Strong, Suttle & Rosenfield, 1972; and Winn, 1972).

Grayson and Shepard (1973) and Neuhaus (1971), on the other hand, are representative of those who characterize environmentalists as "prophets of ecological doom and other absurdities" (Grayson & Shepard, 1973, cover). The writer has found the overwhelming weight of available evidence supports the position of the environmentalists, i.e., there is a critical situation as relates to human interaction with the environment. While this is not in itself the thrust of the study, it constitutes an assumption upon which the study rests.

Individuals and groups have been dealing with environmental and natural resource issues and problems for many years in a variety of contexts, including educational. These educational efforts (designated conservation education, natural resources education or something similar) have been responsible for considerable progress (Clark, 1969, pp. 8-9), yet, on the whole, they apparently have not met all the needs since the environmental situation continues to deteriorate in a number of basic areas (National Wildlife Federation EQ Index 1970 through 1975).

Hobart (1972), in contrast to Clark's position, consigns conservation education to total failure. But he indicates that since conservation education has failed, a void exists and there is a need to build a new structure for understanding the "delicate interrelationships of the natural world and man." Hobart also offers a warning:

> Unfortunately, lacking a coordinated, comprehensive, and uniform base, environmental education too will grind to a halt, axle deep in the same stuff that buried conservation education, for the failures of conservation education were rooted in its lack of foundation.

Environmental education is currently at a stage of development which was passed long ago by many other areas of study, i.e., there is no clearly defined and delineated substantive structure for the area called environmental education (Schoenfeld, 1970, 1971a). There is a great deal of confusion over what actually constitutes environmental education. Much energy has been expended in position papers, models, conceptual frameworks, and course descriptions, but as yet these have not resulted in a generally accepted answer to the question, "What is environmental education?"

Some authors consider environmental education and conservation education to be two names for the same area of study (Clark, 1969), while others believe they are different but closely related with much overlap (Schoenfeld, 1971b). In a statement which is compatible with the researcher's position, (i.e., conservation education is a major contribution to environmental education) Griffith, Landin and Jostad (1971) suggest that

> if we are to accept that conservation as a practice is designed to improve the husbandry of our natural resources, then it is an integral part of any discussion of the environment. If we are to retain or improve the quality of our environment, then conservation must be a part of environmental practice.

Although some authors still use the term conservation education, a majority have started to use environmental education. Regardless of the label used, the need for environmental education has been extensively documented by recent researchers (Brunckhorst, 1971; Chaney, 1970; Isabell, 1972; McKenna, 1973; Schaefer, 1972; Sparks, 1974; and Walser, 1973); therefore, that documentation will not be duplicated as part of this study, but will be considered an assumption, much like the existence of a critical situation relative to human interaction with the environment.

Statement of the Problem

This study will attempt to determine whether there is a substantive structure for environmental education extant in the professional literature. Further, the identification of a generally acceptable definition of environmental education will be undertaken. If, in fact, an educationally viable operational definition and/or substantive structure with some measure of agreement among professionals in the field, do not emerge from the literature, they will be constructed.

Specifically, the following research questions are asked:

1. Based on a search of the literature, and other sources, what are the professional perceptions relative to the following: (a) operational definitions of environmental education, and (b) substantive structures for environmental education?

2. Based on an analysis of the data compiled from the literature, and other sources, is it possible to identify the following: (a) a generally accepted operational definition of environmental education, and (b) a generally accepted substantive structure of environmental education?

3. If, in fact, there is no agreement relative to an operational definition of environmental education, can one be constructed which mediates the differences?

4. If, in fact, there is no agreement relative to a substantive structure for environmental education, what logical, philosophical constraints can be placed on this field that would permit the formulation of a reasonable, educationally sound substantive structure for environmental education?

Significance and Rationale for the Study

The substantive structure of a discipline seems to be of critical importance in the learning process (Ausubel, 1965). Some authors have written extensively on the need to clearly delineate the structure of an area of study (Anderson & Ausubel, 1965; Bruner, 1960; Phenix, 1964; Schwab, 1960a, 1960b, 1962a, 1962b, 1964a, 1964b, 1964c; Whitfield, 1971).

While they may not agree on specifics, they do agree on the need for structure.

Macdonald (1971) points out that

> knowledge oriented work, such as the use of the concept of structure of the disciplines and modes of inquiry, has been the greatest single [curriculum] development in the past decade.

He goes on to indicate that curriculum theory is in a state that may be called "in search of boundaries." The same may be said for environmental education. There are no apparent boundaries, therefore, it is considered to be everything to everyone, and by being everything it is in danger of becoming nothing (Editor, 1975; Tanner, 1974a, 1974b).

Certainly, the need for structural identification is just as real in environmental education as it is in any other academic area. In fact, an argument could be made that the need is even greater in environmental education when one considers sources such as Brennan (1971) who urges that the need for a study related to the substantive structure of environmental education "has an essential urgency as prescribed by the seeming inefficient environmental education of the present and the deteriorating quality of the environment."

Brandwein (1966) using the term conservation, points out situations and needs which are also applicable to environmental education.

> Almost never is conservation a study which combines the biological and the physical sciences, the behavioral sciences, and the social sciences, in a conceptual structure, an art-science, which is relevant to the kind of world now in the making. . . .
>
> Now the point is that a conceptual framework can be developed to give education intellectual discipline; that is, a network of inferences, of relationships of objects and events to each other. The interrelatedness of an area of knowledge (such as conservation) can be demonstrated--that is, the knowledge can be disciplined so that the way further knowledge is acquired

> has discipline.
>
> We had occasion to investigate the feasibility of a conceptual structure in development of curriculums and have found such a structure desirable, practical, and servicable in the best administrative, curriculum, and pedagogical practices.
>
> A conceptual structure is a home for "original" activity of all sorts; indeed without some such structure, it is our thesis, "original" problem-solving activity is merely problem doing. . . . A conceptual ordering permits us to see structure and through structure relatedness.

Schoenfeld (1970) suggests that

> we need in the university community a focused, systematic, responsible, even aggressive concern for the manner in which society is evolving--a concern for its values and problems, and the provision of strategies appropriate to clarify those values and solve those problems.

In a paper presented at the annual Conference on Special Emerging Programs in Higher Education, Dr. John E. Ross has pertinent comments regarding the need for substantive structure in environmental education. Although Ross's comments, like Schoenfeld's, are directed at higher education, they appear to be applicable to all educational levels, and follow:

> Apparently part of the problem [with environmental education] has been the generation of some theme or model around which a core of interested faculty and students could work. It is implied that some conceptual organization of an environmental studies program is the fundamental task for providing a common theme for the disparate disciplines. Measurement (of problems) is not enough of a common theme; some matrix of substantive relationship is required. (Ross, 1970)

Shifferd (1973) also points out the need for a conceptual framework for environmental education.

> The great environmental ferment in this country needs a conceptual framework that will draw together all environmental studies and make them a basis for rational, concerted action at the level of society. Such a framework is needed by the public and the schools.

Tanner (1974b) presents the issue in this manner:

> A significant issue in EE, perhaps ultimately the most important issue, has to do with scope. What concepts and methods are a part of EE? Which are not? Does EE have any boundaries that differentiate it from other educational efforts? If so, what are they? Or is EE anything and everything? Is it "all education," as has frequently been stated? How should EE be defined?

Schoenfeld (Editor, 1975) points out that the definition used in the first issue of the Journal of Environmental Education used the limiting adjective "biophysical" and this was "not a casual insertion; it gave environmental education essential focus." He goes on to point out

> Yet in the call to a current national conference, environment is defined as encompassing "starvation-malnutrition; health care; the oppression of women, minorities, and third world peoples; housing; transportation; discrimination; nuclear power; occupational safety;" and, almost as an afterthought, "the degradation of the physical environment--noise, air, land, and water pollution."
>
> It is of course irrefutable that problems of the human environment include this laundry list, and more. But one is forced to wonder whether, in becoming so all-encompassing, environmental education is not in danger of becoming so diffused as to become ineffectual.

In preparation for the 1975 Belgrade International Workshop on Environmental Education, fourteen "state of the art" papers were prepared by recognized authorities. In one of those papers, devoted to the "nature and philosophy of environmental education: some goals, concepts, objectives and developmental issues," Schmieder (Note 2) points out that, "although some problems are widely apparent, some general goals clear, there is still little consensus as to what the domain of environmental education is, [or] what an environmental educator should know or do" (emphasis added).

Calls for a delineation of the substantive structure have been appearing in the literature, and continue to do so to the current time, including "state of the art" papers. Apparently, a real need would be served by such a delineation which would be generally acceptable.

Other authors who have written about or called for the delineation of the substantive structure of environmental education would include: Brennan, 1973, 1974; Clark, 1969; Covert, 1969; Dasmann, 1969; Jinks, 1975; Stapp, 1971; and Tanner, 1974a.

The phrase "conceptual framework" is used by several authors to describe the structure that is needed. The writer interprets this to be a call not for a list of concepts but for a conceptualization of the field of environmental education, i.e., what are appropriate parts and how do they fit together. In essence, that conceptualization is the thrust of this study.

The procedure, described in more detail in the following section, is to extensively and intensively review the field, synthesize and extrapolate from what is currently extant, and develop appropriate products. The following quote presents a rationale for this type of philosophical study. Although the statement deals specifically with science education, it appears to apply to many areas, including environmental education.

> Scholars in the field of science education should devote more time to reading the results of research in a wide variety of related fields. More of our research studies should be philosophical analyses; in a recent year only three of the 375 research studies identified as science education studies were philosophical treatises. More research reviews should be prepared which synthesize the results of a wide variety of studies; the Review of Educational Research can provide some good modes models. This serious scholarly activity should be utilized as the basis for further research and for making decisions about classroom practice. Science educators need to take the initiative in providing the conceptual framework for research and practice in science teaching (Anderson, 1976).

Procedures

1. The environmental education, conservation education, and other appropriate literature was extensively and intensively reviewed.

2. Pertinent references to (a) an operational definition of environmental education, (b) the substantive structure of environmental education, and (c) other parts of the study, were collected.

3. The references were categorized and arranged logically within each category.

4. Research question "1" was answered by the compiled data.

5. Research question "2" was answered based on an analysis of the compiled data. A conclusion was drawn that it was necessary and productive to go on to research questions "3" and "4".

6. A mediating definition was constructed.

7. Logical, philosophical constraints were placed on the data to obtain pertinent elements/categories of substantive structure.

8. Conclusions, implications, and recommendations components were constructed.

Assumptions

1. There is an environmental crisis in the world today and prospects are for the continued deterioration of the environment in a number of respects unless there are significant changes in the area of man-environment relationships.

2. Environmental education, properly constituted and implemented, is the best hope for ameliorating the negative and reinforcing the positive aspects of environmental issues.

3. Environmental education literature has been appearing regularly

since 1969, and to a limited extent prior to that; therefore, leaders in the field have had several years to formulate theories and develop proposals for what the substantive structure of environmental education is. It is therefore assumed, for this study, that a significant percentage of the leaders (though certainly not all) have published such material and that a review of the professional literature will establish the thinking in the field. Further, a definition or substantive structure would have to be in the literature to be of value to any outside a small circle.

4. If no substantive structure is identified, it is possible to synthesize and/or extrapolate a substantive structure from the data.

5. Because of the extensiveness of the search, the nature of the documentation, and the logic used in the synthesis of data, the final result (i.e., the substantive structure) is valid.

Limitations

1. Because environmental education and conservation education are used synonymously by a number of the professionals in the field, literature referring to both terms was searched. In general, items which are designated nature study, natural history, outdoor education, or other related terms were not considered. The following are exceptions:

   a) as part of the section dealing with history and background.

   b) as part of a document dealing primarily with environmental education.

   c) as a "see also" or other reference.

2. Primarily, secondary sources of information were utilized; however, to ameliorate this limitation, direct contact (correspondence,

telephone, interview) was used as necessary.

3. The term environmental education has been in wide use since 1969, therefore, the study concentrated on the literature from that time to the present. However, to gain perspective and provide a context, earlier work, particularly in conservation education, was reviewed.

4. The study focused primarily on formal education.

5. Although the literature review is both extensive and intensive, no claim is made that it is totally comprehensive.

Definition of Pertinent Terms

Most key terms have been defined within the body of this research. The following are critical and appear necessary to define at this time:

Operational definition--"a definition by means of description of observed properties or behaviors; also, a definition by means of outlining the procedures for reproducing the object or phenomenon being described" (Good, 1973).

Substantive structure--the parts of an area of study and the arrangement/interaction of those parts (after Ford & Pugno, 1964). Substantive structure identifies the parameters or boundaries of an area of study, i.e., the general and specific elements and characteristics which are included in that area of study.

Chapter II

REVIEW OF THE LITERATURE

The review of the literature chapter is divided into three major sections, i.e., history and background, definitions of environmental education, and approaches to identifying and delineating the substantive structure of environmental education. Each of these major sections is, in turn, subdivided as necessary, utilizing standard outlining procedures.

The purpose of the history and background section is to give a historical perspective to the later sections and place the developments of later chapters into a meaningful context. Although brief, the history and background section deals with the period from colonial days to approximately 1969. The period from 1969 to 1976 is the focus of the extensive and intensive review of literature dealt with in the following two sections of this chapter.

The second major section deals with definitions of environmental education. The purpose is to gather many definitions of environmental education into one place for examination. As was indicated in Chapter I, and will be extensively documented in Chapter II, a generally accepted definition of environmental education would provide direction for the field and the professionals active in it.

The third major section of this chapter is to review approaches taken by authors of books, articles, and other documents of professional literature to the delineation of the substantive structure of environmental education, or some parts thereof. The section on approaches is rather lengthy. It is divided into five parts or major approaches, and each of the approaches is further subdivided. A more complete explanation of those divisions is provided in the introduction to the approaches section and at subsequent subsections.

HISTORY AND BACKGROUND

Environmentalism apparently means different things to different people, and the environmental movement probably is not a single movement at all, but a number of individuals and groups, each with their own special interest, but with a common interest in "the environment." On any given issue, environmentalist positions may run from one end of the spectrum to the other (McConnell, 1954; C. Roth, 1971).

Bowman (1972) suggests that "generally, environmental education is considered to have emerged primarily from conservation education, that in turn resulted from a conservation movement in the United States." In order to gain perspective, the history of environmental education will be traced primarily through the conservation movement and conservation education.

Growth of the Conservation Movement in the United States: Early History

Although this treatment of conservation history will not go into the non-U.S., nor the pre-colonial period, conservation events did occur before and in other locations. Glacken (1965) provides some of the earlier data. He then specifies that "historically, the view of the earth as a planet designated and made habitable for all forms of life has involved two attitudes toward living nature: it is beautiful and it is useful."

Nash (1968) points out that the study of conservation history is important because one can determine how earlier generations formulated ideas, implemented them and evaluated results. He points out two pitfalls in the study of conservation history: the diversity of interests that are collectively labeled conservation, which was cited earlier, and the tendency to label individuals or groups as "good guys" or "bad guys."

The environmental movement did not spring to life, full-grown on Earth Day, April 22, 1970. It is the logical outgrowth of the conservation movement and one in a long series of evolutionary events. Conservation has been part of the American heritage since the colonial days, and significant conservation events have occurred in many contexts.

Nash (1968), and Harrah and Harrah (1975), provide chronological lists of significant conservation and environmental events in United States history. Both lists cite 1626 as the year the first ordinance was passed in Plymouth colony regulating the cutting and sale of timber on Colony lands.

Of great importance to the conservation movement are the people who became leaders and influenced the events cited by Nash, and by Harrah and Harrah. Much of conservation history can be told through the activities of these leaders.

Ralph Waldo Emerson and Henry David Thoreau are among the most prominent of the early writers who rejected the exploitation philosophy and recognized the dangers in unrestricted use of land and resources

(Stuhr, 1973). Emerson's book Nature, published in 1863, is considered to be one of his most significant contributions concerning the environment. Thoreau's Walden, published in 1854, was the "first real attempt by an American to work out a philosophy of man and nature" (Stuhr, 1973). Stuhr goes on to point out that the influence these men had on the ethical and aesthetic school of conservation has been pervasive and that they focused attention, through their writings, on the man-nature relationship.

A man who shared the spirit and philosophy of Emerson and Thoreau, but who worked with a more scientific approach, was George Perkins Marsh, who has been referred to as "the fountainhead of the conservation movement" (Stuhr, 1973; Funderburk, 1948; Burton & Kates, 1965). Marsh's book, Man and Nature or, Physical Geography As Modified by Human Action, published in 1864, had a tremendous impact on the way man viewed and used the land. According to Stapp (1974b) this was a significant event in the recognition of the conservation concept.

Ehrenfeld (in Stuhr, p. 70) says that Marsh "was responsible for establishing the broad features of the conservation idea, but he did not determine specific policies." Ehrenfeld suggests this took place during the last part of the nineteenth and early part of the twentieth centuries. Further, it was "during this time that conservationists found themselves split into two groups, one of which was to dominate United States conservation efforts" (Ehrenfeld in Stuhr, 1973, pp. 70-71).

Two Points of View on Conservation

McConnell (1965) suggests that the difficulties in conservation stem from the two different sources of the movement. One source was the deep belief that there is a natural order and balance to nature and that this balance extends to man's activities, i.e., man can put the system out of balance. The other source "was that all goods, all the benefits of nature, were there for the use of man." McConnell also suggests that John Muir spoke for the former source and Gifford Pinchot for the latter.

Leopold (1949) also points out this dichotomy:

> Conservationists are notorious for their dissensions. Superficially these seem to add up to mere confusion, but a more careful scrutiny reveals a single plane of cleavage common to many specialized fields. In each field one group (A) regards the land as soil, and its function as commodity-production; another group (B) regards the land as a biota, and its function as something broader. How much broader is admittedly in a state of doubt and confusion.

The "Natural Order" School

The writings of Emerson and Thoreau form much of the early philosophical foundation for the natural order school of conservation, which is the older position. The work of Marsh is based, to a large extent, on the same philosophical foundation, but it added a scientific dimension to this conservation movement. One of the early leaders, referred to by McConnell (1965) as being the spokesman for this part of the movement, was John Muir.

John Muir.

John Muir was a champion for the aesthetic cause of conservation around the turn of the century. He was a founder and the first president of the Sierra Club, now a national organization active in defending the wilderness and the other aesthetic principles Muir espoused. His brilliant articles in magazines and newspapers "had a profound educative effect on the public mind" (Stuhr, 1973).

Others. Robert Marshall was one who carried the aesthetic banner, particularly in terms of wilderness preservation and was "instrumental in the founding of the Wilderness Society, in 1935" (Stuhr, 1973). The philosophical position of the ethical/aesthetic school of conservation is carried on in the writings of Ernest Swift, Stewart Udall, and others. "These people believe that land has rights that men should respect as part of their ethical code" (Stuhr, 1973).

The Progressive School

The Progressive School is younger than the natural order school and developed around the turn of the twentieth century. Stuhr (1973) suggests that Gifford Pinchot was the first spokesman for this school of conservation, and perhaps the most prominent leader ever.

Gifford Pinchot. This school of conservation and the other have sometimes become confused as to positions on issues, e.g., wilderness. Udall (1963) says of Pinchot, "Over the years the extraction aspects of land conservation became a fetish to him. He always had a blind spot to wildlife and wilderness values: to him, untrammeled wilderness was a form of waste."

Pinchot wrote extensively and excerpts are cited in Nash (1968):

> The first great fact about conservation is that it stands for development. There has been a fundamental misconception that conservation means nothing but the husbanding of resources for future generations. There could be no more serious mistake. Conservation does mean provision for the future, but it means also and first of all the recognition of the right of the present generation to the fullest necessary use of all the resources with which this country is so abundantly blessed. Conservation demands the welfare of this generation first, and afterward the welfare of the generations to follow.

> In the second place conservation stands for the prevention of waste. . . . In addition to the principles of development and preservation of our resources there is a third principle. It is this: The natural resources must be developed and preserved for the benefit of the many, and not merely for the profit of a few.
>
> The conservation idea covers a wider range than the field of natural resources alone. Conservation means the greatest good to the greatest number for the longest time.

Others. Few individuals have attained the stature of Pinchot within the progressive movement of conservation. The Progressive movement is certainly not dead though. It continues primarily through the agencies of the federal government. Federal agencies use the economic yardsticks of benefit-cost ratio or cost effectiveness to measure the need for new conservation projects (McConnell, 1965; Smith, 1966).

Aldo Leopold--The Mediator

Also Leopold is generally placed with Muir and Marsh as one of the key leaders in the natural order school of conservation (Roth, 1971b; McConnell, 1965; Stuhr, 1973). Another position is that Leopold is not part of either school of conservation, but a mediator between them.

Leopold appears to mediate between the extreme utilitarian position of Pinchot and preservation position of Muir. Where Pinchot put man as the dominant factor, and Muir put nature as the dominant factor, Leopold writes of a man-land relationship, i.e., equal partners.

Leopold's classic book, A Sand County Almanac, published in 1949, lays out this philosophy by stressing that conservation decisions can't be made on the basis of economics alone. The ethics of love, respect, and fair treatment must be extended to the land; otherwise, the power of humans to destroy will not be checked.

> The "key-log" which must be moved to release the evolutionary process for an ethic is simply this: quit thinking about decent land-use as solely an economic problem. Examine each question in terms of what is ethically and esthetically right as well as what is economically expedient. A thing is right when it tends to preserve the integrity, stability, and beauty of the biotic community. It is wrong when it tends otherwise. (Leopold, 1949)

Leopold's philosophical position is supported by Swan (1975) and by the Department of Health, Education and Welfare (n.d.). Further, the Department of Health, Education and Welfare publication states "the environmental approach to education is growing from the roots of Aldo Leopold's 'Sand County Almanac' of 25 years ago to the vast number of movements and experiments in EE."

Educational Movements

While "environmental education" has been used in print to describe this movement and area of study only since 1968 (Schoenfeld, 1968), it builds on related educational movements which continue to be major components of environmental education and areas of study in their own right. Three of the educational movements which are most closely associated with environmental education are nature study, conservation education, and outdoor education.

Nature Study

> The antecedents of contemporary environmental education can be traced to the Nature-Study movement which developed during the latter part of the nineteenth century and dominated early childhood science education until the 1929's. (Brice, 1972)

Anna Botsford Comstock (1939) specifies that

> Nature-study is, despite all discussions and perversions, a study of nature; it consists of simple, truthful observations that may, like beads on a string, finally be threaded together upon the understanding and thus held together as a logical and harmonious whole. Therefore, the object of the nature-study teacher should be to cultivate in the children powers of accurate observation and to build up within them understanding.

Conservation Education

The conservation education movement actually has two points of focus: the conservation of human resources and the conservation of natural resources.

Conservation of human resources.

The conservation movement in the first decades of this century was focused on the conservation of human resources. Primarily this took the form of health education and has since evolved into related activities today. Funderburk (1948) provides some details on the early history of this segment of conservation education. Since the focus of this study is more on the natural resource aspects, conservation of human resources will be considered only as it relates directly to the conservation of natural resources.

Conservation of natural resources.

At the 1908 National Education Association annual meeting "Smith officially and soberly declared conservation education as 'seeming to be beyond all others the most important subject which can now be brought before the American people'" (Bowman, 1972). This is among the earliest calls for conservation education, but certainly not the only one.

Swan points out that not much conservation of natural resources education took place in the first three decades of this century because it had become entwined with human resources conservation and "the natural resources concept lost out" (Swan, 1975).

By 1935 though the NEA Educational Policies Commission adopted a position which "became the focus of conservation education throughout subsequent decades" (Swan, 1975). Funderburk (1948) points out that

> beginning in 1935, educational journals carried numerous articles on conservation. From July 1935 to June 1938, fifty such articles were listed in the Education Index. Many of these considered the problems of conservation education.

The period from the middle 1930's to the early 1940's was a time of active involvement in conservation of natural resources education at the national level. In 1936 it was suggested that a special office be set up in the U. S. Office of Education. In June 1936 the office was temporarily established, and in 1937 it published Conservation in the Education Program (Funderburk, 1948).

The period from the mid 1940's to the late 1960's has had little written about conservation education programs, although as Clark (1969) points out that many fine programs were in operation. It is in the area of educational legislation that the major emphasis seemed to be during that time, with a number of states passing legislation requiring the teaching of conservation (Funderburk, 1948; Swan, 1975).

Outdoor Education

The writer is reluctant to include outdoor education in this chronology due to the fundamental difference between it and the previously cited areas of study. Where nature study and conservation education have a content base, outdoor education is a method without content. It is purported to work as effectively with math or music as with conservation.

Some authors, while recognizing this difference, have still tried to make a case for environmental education being a direct result of a fusion of conservation and outdoor education (Kirk, 1974). This may lend more weight to outdoor education per se than is justified by the importance of a single method. Parsons (1969) warns outdoor educators not to fall into the trap of becoming part of nature study or conservation education.

DEFINITIONS OF ENVIRONMENTAL EDUCATION

Environmental education has been defined by many of those writing in the field. The purposes of this section are: (1) to cite or quote many of the definitions found in the professional literature; and (2) to arrange the definitions chronologically so that any evolutionary trends which are present will emerge. Analysis and synthesis of the definitions will take place in Chapter III.

Most of the definitions cited or quoted will conform to Good's (1973) definition of an operational definition, which follows:

> Operational definition--a definition by means of description of observed properties or behaviors; also, a definition by means of outlining the procedures for reproducing the object or phenomenon being described.

However, some of the cited or quoted items will be less formal, definition-type statements. The latter are cited or quoted where the author's apparent intent is to describe the characteristics of environmental education in a manner other than a formal definition.

Pre-1969 Definitions of Environmental Education

Prior to 1969, the term "environmental education" was used very little in the literature. One of the earliest uses is the article by

Schoenfeld (1968). He did not specifically define the term in the paper. Bowman (1972) cites the use of the term by the Welsh Project Committee in the following definition:

> Environmental education is an approach through activities based upon the child's natural and man made environment, which leads to the progressive development of attitudes and skills required for the study of other environments in time and space. (Welsh Project Committee, 1968)

Definitions of Environmental Education Published in 1969

While only one definition of environmental education was identified in the literature published in 1969, many appeared in the literature published prior to 1969. Certainly a contributing factor was the debut of Environmental Education, later renamed Journal of Environmental Education, in the fall of 1969. A majority of the definitions and definition-type statements identified were published in this professional journal.

Beginning on page 1 of volume 1, number 1, of Environmental Education, the editor (Clay Schoenfeld) asks the question, "What's new about environmental education?" He answers the question by constructing two lists, one describing today and one describing yesterday.

YESTERDAY	TODAY
Compartmentalized	Comprehensive
Parochial interests	Broader awareness
Local	Global
Rural	Urban
Appended rationales	Indigenous concern
Evangelical	Ecological
Resource-centered	Man-centered
Terrestrial	Universal
Biophysical science	Social studies
Gospel of efficiency	Quest for quality
Technological impetus	Public involvement
Unilateral solutions	Open-ended options
Elementary education	Adult education
Print media	All media
Hunch	Research
Business as usual	Sense of urgency

Stapp, et al. (1969) define environmental education as follows:

> Environmental education is aimed at producing a citizenry that is knowledgeable concerning the biophysical environment and its associated problems, aware of how to help solve these problems, and motivated to work toward their solutions. (Emphasis in original)

The definition is quoted by several others cited later in this section, and many of the elements will be found in somewhat modified form in a number of other definitions.

Dana (1969) provides the following definition:

> Environmental education deals comprehensively with both human resources and natural resources and their relationship to each other--in other words, with the "total environment."

He further states that

> Environmental education aims to develop a citizenry with an understanding of the many complex problems in this broad field, and with the ability and the motivation to participate in the solution.

Hill and White (1969) describe the characteristics of environmental education in the following manner:

> The new environmental education is resulting from the crucial needs and problems of man in relation to his environment. It is people centered and includes urban as well as rural areas. Natural resources--their uses, preservation, and enhancement--are considered in their relationship to people.

Southern (1969) states that in order to be truly environmental education, it must be "the study of man in relation to his environment."

Swan (1969) defines environmental education in a manner very similar to Stapp, et al. (1969). Swan goes on to point out that the real concern of environmental education is not to make every individual a naturalist, but that they become involved in environmental problem solving.

Others published in 1969 include Clark, Covert, and Sherwood.

Definitions of Environmental Education Published in 1970

In 1970 a number of definitions and descriptions of environmental education were published. It was the year of the first Earth Week and Earth Day (April 22) and has been referred to as the "year of the environment" (Morrissett, 1975).

Roth (1970a) defines environmental management education in a manner similar to Stapp's (1969) definition of environmental education, with the major change being the addition of "sociocultural" to the biophysical knowledge suggested by Stapp, et al.

Archbald and Gundlach (1970) contrast environmental education with some components of conservation education.

Winn (1970) defines environmental education through describing two dominant themes: (1) an integrated or interdisciplinary approach as opposed to narrower traditional offering, and (2) the necessity to not only provide ecological information but to get people to act to prevent or resolve environmental problems.

Wang (1970) took the characteristics in the two lists of Schoenfeld (1969), modified some of them, and classified them in terms of goals, methods of approach, regional coverage, disciplinary boundaries, and solutions.

Horn (1970) offers the following definition:

> Environmental education is the process of recognizing and clarifying the values, attitudes, and concepts necessary to understand and appreciate the interrelatedness among man, his culture, and his biophysical environment. Environmental education, moreover, entails practice in decision-making about issues concerning environmental quality.

Schoenfeld (Editor, 1970b) considers the factors of the term environmental studies as it might be used relative to a university. He suggests five such factors: (1) the environment of man; (2) the total environment; (3) interdisciplinary studies; (4) integrated studies that will lead to long-term open-ended solutions; and (5) an integrated environmental ethic based on the scientific method.

Brennan (1970) uses Brandwein's (1966) definition of conservation as a basis for a definition of environmental education. He states that environmental education is:

> that education which develops in man a recognition of his interdependence with all of life and a recognition of his responsibility to maintain the environment in a manner fit for life and fit for living--an environment of beauty and bounty in which man lives in harmony. The first part of environmental education involves development of understanding; the second, development of attitudes--a "conservation ethic."

Smith (1970) suggests that environmental education has the following components: (1) problem oriented; (2) urban and community oriented; (3) political-citizen action oriented; and (4) that it spans the curriculum. Further, environmental education is "the study of all things surrounding man which affect his existence and is aimed at producing an informed citizenry, motivated to the recognition of problems and to collective action for solution."

The Conservation Education Association (1970) use what is essentially Brandwein's (1966) definition of conservation as part of their policy statement on definition.

The Environmental Education Act of 1970 contains the following:

> For the purposes of this Act, the term "environmental education" means the educational process dealing with man's relationship with his natural and manmade surroundings, and includes the relation of population, pollution, resource allocation and depletion, conservation, transportation, technology, and urban and rural planning to the total human environment.

The Department of Health, Education and Welfare (n.d., but about

1970) offers:

> Environmental education is a study of the factors influencing ecosystems, mental and physical growth, living and working conditions, decaying cities, and population pressures. Environmental education is intended to promote among citizens the awareness and understanding of the environment: our relationship to it, and the concern and responsible action necessary to assure our survival and to improve the quality of life.
>
> Environmental education is a lifelong process. It is a way of looking at life, fostering awareness of other life and of inter-relationships, learning to recognize the effects (good and bad) we have on physical surroundings, and the responsibilities we must accept for the mere fact of our presence and of our activities in our environment. It should enable us to make sound ecological decisions and foresee their consequences; to make value judgments, and act accordingly. It is acceptance of life values and ways of living which minimize destruction and maximize those relationships that enhance life. It is learning how to contribute to the quality of life, and the constructive use, rather than exploitation, or the environment.

They also use, without citation, Brandwein's (1966) definition.

Several other definitions were identified as being published in 1970, including Allen (1970); EPIE (1970); Menesini (1970); Rillo (1970); UNESCO (1970); U. S. National Committee for UNESCO (1970); and Vivian and Rillo (1970).

Definitions of Environmental Education Published in 1971

The Educational Products Information Exchange (1971) describes the state of affairs relative to definitions in this area of study.

> At a recent environmental education conference, the following terms were used synonymously: Environmental Education, Environmental-Ecological Education, Ecological Education, Conservation Education, Camping Education, Outdoor Education, and Environmental Science Education. . . . Ideally, environmental education is the teaching of an awareness of the natural world around us and how man and his technology relate to that world.

Griffith, Landin, and Jostad (1971) offer the following:

> Environmental education is an integrated process which deals with man's interrelationships between his natural and man-made surroundings. It is intended to promote among citizens the awareness and understanding of the environment, our relationship to it, and the concern and responsible action necessary to assure our survival and to improve the quality of life.

Definitions of Environmental Education Published in 1972

Authors continue to cite previously published definitions, but some additional ones are added.

McInnis (1972) specifies the "fundamental characteristics of effective environmental education."

1. That education is most environmental which most facilitates a direct encounter of the learner with the environment being learned.

2. Those environments are most educational which maximize the learner's potential capacities to function successfully as an intelligently integrating multi-sensory organism. (The key word here is "intelligently," which feature distinguishes the human organism from others. The use of "integrating" rather than "integrated" is also vital, since it indicates an ongoing process.)

Definitions of Environmental Education Published in 1973

Brennan (1973) uses Brandwein's (1966) definition of conservation, and then cites a definition used by Northern Illinois University.

> The process of recognizing values and clarifying concepts in order to develop skills and attitudes necessary to understand and appreciate the interrelatedness among man, his culture, and his biophysical surroundings. . . . Environmental education entails practice in decision-making and self-formulation of a code of behavior about issues concerning environmental quality.

Bogan (1973) offers two long definitions:

WORKING DEFINITION 1 (emphasizing process and theory)

Environmental education is the process that fosters greater understanding of society's environmental problems and also the

> processes of environmental problem-solving and decision-making. This is accomplished by teaching the ecological relationships and principles that underlie these problems and showing the nature of the possible alternative approaches and solutions.
>
> That is, the process of environmental education helps the learner perceive and understand environmental principles and problems, and enables him to identify and evaluate the possible alternative solutions to these problems and assess their benefits and risks. It involves the development of skills and insights needed to understand the structure, requirements, and impacts of interactions within and among various environmental entities, subsystems, and systems.
>
> WORKING DEFINITION 2 (emphasizing content and purposes)
>
> (The first paragraph is from the Environmental Education Act of 1970, previously cited.)
>
> That is, environmental education is the process of inquiry into both the specific and general environmental implications of human activities viewed from the perspective of social needs and values as they relate to general public policy.

Bogan goes on to suggest that environmental education is both multidisciplinary and interdisciplinary, not a single discipline, and that in order to accomplish the goals of environmental education it will be necessary to utilize at least four broad areas: the total environment and its problems; ecological principles, concepts and relationships, all of the educational system including formal and informal; and many of the traditional disciplines.

The National Park Service (1973) offers the following definition:

> Environmental education is not a single subject; neither is it only the teaching of school subjects out-of-doors. It uses all curriculum subjects and skills with the ultimate goal of developing in the child an understanding of what his relationship to the total environment is, and, consequently, what his responsibility to it must be.

Hawkins and Vinton (1973) offer several definitions and definition-type statements about environmental education. They indicate that a citizen capable of ameliorating environmental problems must have awareness, a proper value orientation, a multidisciplinary problem-solving focus, and the ability to recognize the course of effective action. An individual must acquire an environmental ethic, i.e., a concern for and commitment to the environment. In addition, he must be able to make choices from equally attractive options and then act on these decisions. This ethic must guide interactions with the earth's resources and with his fellow man.

They go on to suggest that

> above all, environmental education is oriented toward development of values that are translated, ultimately, into action. Awareness, appreciation, and understanding of the environment are only the first steps and do not necessarily lead to effective action.

Definitions of Environmental Education Published in 1974

Zeitler (1974) suggests that environmental education for children could help children be prepared to identify, analyze, and solve problems they will face as adults. In order to achieve this, it is necessary to use an approach to environmental education in which children:

1. become knowledgeable about the total environment and current problems;
2. are provided with the opportunity to analyze problems;
3. engage in searching investigations to determine the far reaching implications of these problems as one component of the environment relates to and interacts with other components (2);
4. develop a concern for and desire to maintain a quality environment both for the present and future.

Concepcion-Medel (1974) specifies four characteristics of an individual "who is the end-product of an ecologically-oriented curriculum." She goes on to say that environmental education "is defined as the process of developing in a citizenry:

1. knowledge of his total environment and the interrelatedness among man, his culture and bio-physical world;
2. skills in problem-solving, critical thinking and social change strategies;
3. awareness of environmental problems, attitudes and values necessary for the wise use and management of natural resources;
4. the decision-making skills and code of behavior for positive action on issues concerning the environment.

Jackson (1974) uses a definition based on the Environmental Education Act of 1970.

Jinks (1974) offers the following short definition: "Environmental education--for the purposes of this study; an education idea which focuses upon a holistic interpretation of environments including the environment of self."

Ulrich (1974) says that environmental education is "the educational process which attempts to modify man's attitudes toward his world, and to motivate him to action in solving basic man-environment problems."

Tanner (1974b) suggests that "EE deals primarily with man-earth relationships. It deals with man-man relationships only as they affect, or are affected by, man-earth relationships."

The ECOS Training Institute (1974) offers the following:

> Environmental education is a multidisciplinary process that helps the learner perceive [and] understand environmental principles [and] problems and enable him to identify, evaluate [and] assess possible alternative solutions, benefits and risks leading to a solution.

Like Bogan (1973), the ECOS Training Institute specifies that environmental education utilizes four broad areas: (1) total environment and problems; (2) ecological principles, relationships and concepts;

(3) the entire educational system including formal and informal; and (4) traditional disciplines: chemistry, physics, biology, sociology, economics, psychology, arts, anthropology. "Each E. E. activity partakes of aspects of these areas pointing up to interrelationships, therefore, the tools of various disciplines are used in higher integrative manner."

Concepcion-Medel (1974) cites and quotes several definitions of environmental education. These definitions are among those cited, according to year of publication, as having been identified; however, those which were not also found in the original publication were not quoted.

Definitions of Environmental Education Published in 1975

Aldrich and Blackburn (1975) define environmental education in terms of the individual, e.g., "appreciate a personal relationship to his total environment or world." They list the following objectives for environmental education, applicable at all levels.

1. better and fuller understanding of the complex natural and technical phenomena of the world in which we live,
2. awareness and appreciation of the difficult personal choices and sacrifices that must be made to achieve a higher quality of life,
3. individual development of appropriate vocational and specialist skills,
4. appreciation of the interrelatedness of all systems, and the benefits of international environmental thinking,
5. appreciation of diversity and a realization that the problems and solutions which one society holds true are not necessarily relevant or appropriate to other societies, and
6. climate of public awareness which supports political and social readjustment and/or change.

Hungerford and Litherland (1975) offer the following:

> Environmental Education: That aspect of man's education that deals with culturally-imposed, ecologically-related problems in man's environment . . . further, the acquisition and application of human values as related to the cultural use and misuses of biotic and abiotic resources.

Morrissett (1975) states that "environmental education is defined as those parts of the environmental problem and environmental science which are incorporated into any educational program." He defines an environmental problem as one that involves natural resources and social interactions and consideration of human value systems.

McGowan and Kreibel (1975) cite the following definition as being in the Federal Register:

> Environmental education is the process that fosters greater understanding of society's environmental problems and also the process of environmental problem solving and decision-making. [It is] not a single discipline, but rather is interdisciplinary and multidisciplinary.

Hernbrode (1975) offers definitions of both conservation education and environmental education for comparison.

> Conservation education--the educational process of communicating an understanding of the characteristics, distribution, status, uses, problems, and management policies of basic natural resources, with an emphasis on "stewardship" and "wise use."
>
> Environmental education--the process leading toward the development of a citizenry that is aware of and concerned with the environment and its associated problems, and that has the knowledge, skill, motivation, and commitment to work toward solutions to current and projected problems.

APPROACHES TO IDENTIFYING AND DELINEATING THE SUBSTANTIVE STRUCTURE OF ENVIRONMENTAL EDUCATION

The need for structure in environmental education was documented by several references cited in Chapter I of this study. Therefore, they will not be cited again, nor will others be cited to make the same point. The point being, there has been a consistent call in the literature for the substantive substructure of environmental education to be clearly delineated, and this call has been answered by a number of the authors writing in the field, directly and indirectly. After the data were identified and collected, they were examined by the researcher for patterns of approach so they could be categorized for analysis.

Authors have taken several different approaches to delineating substantive structure. The following categories of approach were identified in the data: (1) position papers which describe all or some part of environmental education as it is or should be; (2) paradigms which represent all or some part(s) of environmental education as it is or should be; (3) concept lists and curricula which are intended to represent all or some part(s) of environmental education; (4) course(s) approach, which may be content for a course or a sequence of courses; and (5) supplemental and other approaches which are different from those approaches cited above.

The remainder of the chapter will cite those attempts to delineate the substantive structure of environmental education which have been identified in the literature.

Position Papers on the Substantive Structure of Environmental Education

Position papers are statements about what the author(s) perceive to be the substantive structure of environmental education, or what they would like to see it become. The papers cited here represent a part of the total literature available, but since many of the papers are by persons who, either by position or accomplishment or both, are considered leading thinkers in the field, it is considered to be a sampling of some of the best thoughts.

The papers are grouped into six areas, although, there is much overlap. The areas are (1) general, (2) philosophy, (3) man-environment relationship, (4) expected outcome, (5) curriculum and instruction, and (6) process and procedures.

General

In an early study aimed at producing conservation concepts, Geer (1958) points out that there "is an abundance of material written on the subject of conservation which combines the subjectivity of values with the objectivity of science." He goes on to indicate that he will be dealing with objective principles and that "integration of values and conservation would seem to be a task for other researchers."

Hill (1970) lists some specific characteristics of environmental education programs in schools: people centered rather than resource centered; urban as well as rural; the children must be actively involved; all schools and all children should be involved; and learning by discovery is considered vital.

Jeske (1970) presented a paper in which he suggested that

> among the guiding principles of effective environmental conservation education efforts that extend from pre-school through college we want to find:
>
> emphasis on learning about the total ecosystem rather than its parts and, when attention is given to specialized aspects of the subject, such as geology, soils, plants, waterfowl, pollution, or population, they are related to the total system of which they are parts;
>
> emphasis on development by the learner of concepts and generalizations from the biophysical world and the socio-cultural environment, that is, using deductive thinking to apply general principles as well as inductive logic to formulate generalizations;
>
> emphasis on field study on a regular basis at a readily accessible site, preferably an outdoor learning area adjacent to the classroom;
>
> emphasis on conservation education as an integral part of all subject areas, with interdisciplinary courses at the higher academic levels; serious consideration might well be given to using environmental studies as the core curriculum;
>
> emphasis on examination of basic attitudes and values--with changes in behavior as the objective but without coercion regarding values.

Fox (1970) suggests that there are three major problems and five critical issues in environmental relations. The problems are: environmental quality, managing the resource industries, and realizing scientific and technological opportunities. The critical issues are: population control, extinction of plant and animal species, the application of knowledge to resources potential, policy design, and international flow of capital and resource commodities.

Stapp (1971) suggests that environmental education advocates an interdisciplinary, problem-solving approach; can serve as a link between subject matter fields and reinforce the curriculum; is most successful when teachers are willing to discuss values questions from a variety of points of view; and works best with staff well trained in environmental education. (See, for example, Bennett (1975), Engleson (1975), and Stapp (1975) for suggestions regarding teacher training for environmental education.) Further, environmental education is concerned with both attitudes of concern about the environment and skills to reach goals resulting from concern.

R. Roth (1971) specifies that environmental education should be interdisciplinary, and would develop cognitive understanding, belief, and attitude change, and provide motivation for behavioral change. Man in nature rather than man apart from nature should be the theme. The program should be K-12 and adult; should take contributions from the sciences, the social sciences, and the humanities; should take place in appropriate environments; and content should come from many areas.

Hamann (1972) suggests that environmental problems may be classified under the following headings: "ecological concerns, technological concerns, quality of environmental status, population pressures, and over-consumption of energies."

Bowman (1972) suggests there are some commonalities in the current thinking about environmental education, particularly related to affect:

1. The emphasis for process rather than content methodologies in environmental education programs,
2. the belief that environmental education is directed at modifying attitudes toward the environment,
3. the need for research in the attitudinal realm to develop a means of assessing current environmental attitudes and to use such means in evaluating the effect of environmental education programs; and,
4. the need for sound decision-making that can create diverse environments within the total environment.

Bowman also suggests that

> [environmental] education is challenged to provide direction in modifying attitudes toward the environment in an effort to improve environmental decision-making to enhance the quality of life.

Bruker (1972) suggests as one of his conclusions, that

> the current emphasis on environmental education programs is very much like the emphasis on conservation education programs twenty-five to thirty years ago. From the review of related literature and the questionnaires and interviews it is apparent that the basic concerns of both movements are the same--soil, water, forests, and wildlife. The conservationists stress the conservation of natural resources; the environmentalists, in addition to espousing the same interests, have included an area of human concern. To the basics they have added air pollution and population control, both of which they feel to be necessary to the study of man's relationship with his physical environment.

Ayres (1972) lists eleven characteristics for environmental education:

a) Its purpose should be to establish sound, ecologically oriented attitudes.

b) It should be aimed at achieving an integrated understanding of man's interrelationship with his environment and all of its inhabitants.

c) It should avoid orthodoxy in favor of innovative approaches to accepting a pluralism of values.

d) It will be stimulated by imaginative utilization of new educational technologies, especially television.

e) It should be based on facts and encompass all disciplines and most especially the humanities.

f) It should be differentiated so that the content can be shaped appropriately for the students' level of understanding.

g) It should be aimed at all segments of society.

h) It should be a joint function of many institutions of our society--school, family, church, etc.

i) It needs special attention to the training of coordinators and consultants to assist teachers in relating their subject effectively to the overall environmental concepts.

j) It demands cooperation, coordination, and coherence from the diverse public and private agencies and organizations involved.

k) Its most important ingredient is you--individually and collectively--combining participatory citizenship with basic environmental principles.

Cummings (1973) specifies five themes which he says run through environmental education. The primary element is the Spaceship Earth philosophy--a recognition that the earth is a closed, finite system and man is restricted to it. The five themes are: (1) environmental education is not part of one discipline; (2) it affects all ages and all walks of life; (3) it goes beyond knowledge and skills into the formation of an ethic and aims toward action behaviors to change environmental conditions; (4) it is man-centered and generally avoids the strict ecological approach; and (5) environmental learnings should be focused and founded on actual experience.

Cummings poses the question "What does environmental education have to offer that is not already subsumed under traditional headings?" He suggests that each theme is already dealt with in some context, and they appear too complex to be easily related, yet when properly handled, they affect people's lives.

> What is needed is some concrete and unifying structure that incorporates these themes in a manner that utilizes their classroom potential in the best way possible and provides direction to curriculum developers and teachers.
>
> For the most part, environmental education must turn to existing institutional structures and established subject matter areas if it is to survive. It becomes imperative, then, to regard environmental education in terms of what it can contribute to these subject areas and in terms of how it is to function within the framework of the public schools.

Agne and Nash (1974) contend that unless environmental education corrects three "misdirections" in the movement, it will become a

"fraudulent revolution." The three points specified are: (1) "Environmental education is allopathic. In medicine, an allopathic model is one that treats disease, illness, or conflict by counteracting symptoms." They would like to see "considerably more emphasis on values-, feelings-, and attitudes-analysis and understanding than exists now in the environmental literature." The components of an individual's total life-style, and value orientations must be "dealt with openly and candidly."
(2) "Environmental education is system-conserving."

> All the emphasis on cleaning up streams, carrying out water analysis and soil tests, planting trees, growing gardens, and reducing automobile exhaust emissions actually obscures the need for deep-seated change in economic, political, and educational policies.

The authors point out a number of specific situations related to economic, political, and educational change which they see as critical.
(3) "Environmental education avoids critical analysis of American technology." They suggest "it is time for environmental educators to admit that more technology is not needed to solve the problems that technology has precipitated in the first place." Specifically they suggest an "environmental value agenda" to help evaluate new technology, and the necessity of introducing students to a variety of life-styles which are less technologically dependent.

Concepcion-Medel (1974) suggests several guidelines for the development and implementation of environmental education programs, particularly as related to science. The guidelines are:

I. Integrate ecology concepts at all elementary and secondary levels in the science curriculum to make it environmentally oriented.

II. Involve the students in acquiring process skills essential to reflective and critical thinking, inquiry and problem-solving.

III. Design and sequence learning activities that accommodate diverse needs, abilities, backgrounds, environments and developmental stage of the learner.

IV. Emphasize the development of attitudes and values.

V. Focus on the real and immediate topics, problems and issues in the local environment which the students experience and can resolve.

VI. Utilize to the maximum out-of-class resources in the school site and extending into the community.

VII. Apply the multidisciplinary approach in related subject areas.

VIII. Evaluation should be an integral and continual process, providing data necessary for the improvement of the program.

IX. Provide for extensive in-service teacher education program.

Jinks (1974) provides "recommended components of environmental education curricula." He suggests four components and cites several references supporting each of the components, which are: interdisciplinary nature, value system component, experiential component, and man-nature component.

Rillo (1974) suggests that environmental literacy on the part of citizens is necessary to slow the pace of environmental change.

> What is needed is an aware, articulate, and activated citizen who is willing to donate time, energy and resources toward the solution of environmental problems. What is needed is a framework of reference which can help guide one in making wise decisions in the struggle for a quality environment. Environmental education should be integrated into the regular academic curriculum of the school."

Rillo provides ten basic guidelines for environmental education which may be summarized as follows:

1. Environmental education should begin where the individual lives, works, goes to school, and spends most of his or her time. . . .

2. No two programs of environmental education need to be alike. . . .

> 3. Environmental education should not be interpreted as being the same as environmental science. . . .
>
> 4. Environmental education in a community needs a catalytic force. . . .
>
> 5. Environmental education should be organized into two major approaches [i.e., the formal and non-formal]. . . .
>
> 6. Evolving environmental education information and curriculum materials should be available to all. . . .
>
> 7. Continued environmental research needs to be conducted. . . .
>
> 8. Colleges and universities need to accept increasing responsibility. . . .
>
> 9. There needs to be complete support at the state level and representation by an advisory council which could supervise the development of an overall master plan thereby coordinating all resources and all efforts toward common goals.
>
> 10. Environmental education should be available to all regardless of socioeconomic level, creed, color, or race. . . .

McInnis (1975b) suggests that "no single, adequate definition of environmental education exists, but the following list of components is representative of the movement's concern with procedure."

> perceptual awareness
> conceptual understanding of the natural environment
> conceptual understanding of the man-made environment
> aesthetic discrimination
> values and value clarification
> fostering creative abilities and attitudes
> humanism
> organized skills and knowledge
> decision making

The editors of a number of major educational journals recently published this joint position on environmental education: (Hawkins, 1975)

> We, the undersigned editors of national educational journals, therefore wish to publicize as widely as possible our three point position on this problem:
>
> 1. Integrated design--Disaster will be prevented, now and in the future, only by achieving an understanding of the natural integrated design encompassing all components of man-environment relationships.

> 2. Interrelationships of environment--We recognize the finiteness of this planet and our finitude upon it and that our survival depends on our ability to perceive our position in nature and to fulfill our responsibilities.
>
> 3. Interdisciplinary solutions--The complex problems of the environment require that efforts toward solutions be truly interdisciplinary.
>
> Environmental problems require a comprehensive, problem-solving approach and a concerted effort by all disciplines. . . . Our students must not only be aware of these efforts but active in their support of them.

DuShane (1974) points out that

> The United States Office of Education also has developed a consensus of the basic characteristics of good environmental education. These include:
>
> 1. A multidisciplinary approach, with emphasis on the interrelationships of man and nature.
>
> 2. A focus on contemporary problems relating to the urban and rural environment--man-made and natural.
>
> 3. Incorporating the nonformal as well as formal education processes and utilization of resources outside the classroom.
>
> 4. Development of understanding and attitudes as well as information.
>
> 5. Involvement of all age groups; and
>
> 6. A participant-centered design, involving learner/participant in choosing priorities both as to the issues to be studied and the solutions that seem most appropriate. This design allows the participant to learn "how to learn" about new situations, how to weigh alternatives and how to test solutions.

Philosophy

The term "Spaceship Earth" is one which occurs in much of the environmental literature, and the philosophy expressed by the term may be inferred from the context in additional writing where it is not stated. One of the earliest cases where it is clearly inferred is in an often quoted passage from a United Nations speech of Adlai Stevenson (1965) which follows:

> We travel together, passengers on a little spaceship, dependent on its vulnerable reserves of air and soil; all committed for our safety to its security and peace; preserved from annihilation only by the care, the work and, I will say, the love we give our fragile craft.

Barbara Ward (1966) titled a book Spaceship Earth. In the preface she states the following position:

> In the last few decades, mankind has been overcome by the most fateful change in its entire history. Modern science and technology have created so close a network of communication, transport, economic interdependence--and potential nuclear destruction--that planet earth, on its journey through infinity, has acquired the intimacy, the fellowship, and the vulnerability of a spaceship.

Ward points out the differences among nations and individuals, in terms of wealth, power, and ideology and the necessity for restoring a reasonable balance of power, wealth, and "of understanding and tolerance between the world's rival creeds." She then states:

> When the grosser inequalities have been remedied, there can be more hope of building the common institutions, policies, and beliefs which the crew of Spaceship Earth must acquire if they are to have any sure hope of survival.

Bates (1969) deals with the same theme when he states

> Our planet has been aptly called "Spaceship Earth." It forms, overwhelmingly, a closed system as far as materials are concerned. Science fiction to the contrary, we have no present basis for believing that this essential isolation will be altered--that we can colonize other parts of the solar system or import from outer worlds any appreciable quantities of materials. This earth is our habitat and probably will be as long as our species survives. We would do well, then, to treat it carefully and to take thought in planning our actions.

In one of the earliest references to "Spaceship Earth," Boulding (1966) points out man's gradual change of perception in relation to the earth, from a source of limitless resources to "a closed sphere of human activity." He suggests that "systems may be open or closed in respect to a number of classes of inputs and outputs. Three important classes are matter, energy, and information."

He deals with each of the three systems and comes to the conclusion that a closed system is possible in terms of material, but that there is the Second Law of Thermodynamics to be dealt with in energy, i.e., sources of energy will continue to be needed. He leaves open the question of entropy in terms of information.

He suggests that the open economy, which he calls "cowboy economy" must be transformed into a closed or "Spaceman" economy. "The closed earth of the future requires economic principles which are somewhat different from those of the open earth of the past."

In the future of "spacemen" economy

> the earth has become a single spaceship, without unlimited reservoirs of anything, either for extraction or for pollution, and in which, therefore, man must find his place in a cyclical ecological system which is capable of continuous reproduction of material form even though it cannot escape having inputs of energy.

Fuller (1969) points out that

> Spaceship Earth was so extraordinarily well invented and designed that to our knowledge humans have been on board it for two million years not even knowing that they were on board a ship. And our spaceship is so superbly designed as to be able to keep life regenerating on board despite the phenomenon, entropy, by which all local physical systems lose energy. So we have to obtain our biological life-regenerating energy from another spaceship--the sun.
>
> You know that you're either going to have to keep the machine in good order or it's going to be in trouble and fail to function. We have not been seeing our Spaceship Earth as an integrally-designed machine which to be persistently successful must be comprehended and serviced in total.

Garret Hardin (1968) in an often cited and often reprinted paper, examines the "tragedy of the commons." Briefly stated, his position in this paper revolves around the necessity to limit the growth of human population. He points out the impossibility of maximizing two factors simultaneously (i.e., "the greatest good for the greatest number") therefore he concludes the greatest good can only be achieved for some number less than the maximum.

Hardin deals with the "commons," or that which is available for all to use. Three points made in the paper related to the commons are as follows: (1) what may be acceptable in a given area or time may not be acceptable in another area or time, primarily as a result of the population positon stated previously; (2) the commons can be abused by taking away or overusing, such as overgrazing grasslands; and (3) the commons can be abused by adding something which is a disruptive or destructive influence, such as radioactive materials, chemicals, sewage, and heat.

Hardin goes on to suggest that the remedy lies not in development of conscience but in "mutual coercion mutually agreed upon" or in other words, rules with penalties related to abuse of the commons just as there are rules (i.e., laws) against bank robbery with penalties for those convicted of violating those laws or rules. He suggests that conscience development is not the answer to abuse of the commons because of the intended and unintended communication conveyed by an admonition to resist doing something to exploit the commons, i.e., if you do not do as asked you will be condemned, and if you do as you are asked you are a simpleton who is standing aside while others exploit the commons.

Hardin (1972b), originator of the "lifeboat" concept as it relates to the "Spaceship Earth" position, states "Let's begin with this simple idea: Earth is a Spaceship." Using the analogy of a small spaceship, one millionth the size of earth, he asks and answers a series of questions. Those questions and answers relate to human population growth and its impact. Hardin strongly argues for population control as the only viable long-term solution to environmental problems. He concludes "excess population is no longer an element of national strength; it is a cause of national weakness."

Speaking in Mexico, Hardin stated as a final comment

> As one wishes well for all mankind, for all of the inhabitants of spaceship Earth, I hope that you can learn from our mistakes--from the mistakes of all the nations that have preceded you in the development process--so that you can do better than your predecessors did. If you escape making our mistakes you may ultimately be far stronger than we. If so, you will benefit. In fact, the entire world will benefit. Your intelligent trusteeship of the corner of the world's goods that is yours to take care of can benefit the community of all of us who live on this finite, and really rather tiny, spaceship Earth.

Hardin (1974), in an article titled "Living on a lifeboat," points out some of the shortcomings of the Spaceship Earth metaphor, specifically the implication of immigration. He also states that "the spaceship metaphor is used only to justify spaceship demands on common resources without acknowledging corresponding spaceship responsibilities." Hardin suggests that the "ethics of the lifeboat" are those that must be recognized as critical to the solution of environmental problems.

Hardin deals with human population, the "commons," the world food bank, the green revolution, and immigration to build a case for his position that human population growth is the major factor which will eventually cause "our grandchildren--everyone's grandchildren--[to] have only a ruined world to inhabit."

He concludes with the admonition that "for the forseeable future survival demands that we govern our actions by the ethics of a lifeboat.

Posterity will be ill served if we do not."

Man-Environment Relationship

Swan (1969) indicates the "outstanding characteristic of our time is the headlong rush of science and technology." He goes on to point out a number of environmental problems related to the misapplication of technology and lack of citizen awareness. "While it is true that technology can solve [some] environmental problems it takes people to implement technology. . . . creating a concern for environmental quality can and I feel should, be a function of our schools." He also points out that for optimum effectiveness, the environmental education program should span the K-12 curriculum.

Commoner (1971) suggests an informal set of "laws of ecology" which can be construed to go beyond ecology as a subject-matter area and deal with the man-environment relationship in terms of the spaceship earth position specified earlier. The "laws" are as follows:

1. Everything is connected to everything else.
2. Everything must go somewhere.
3. Nature knows best.
4. There is no such thing as a free lunch.

Tanner (1974a) states

> Some have noted--sensibly, we think--that EE will not have significant impact if it has no meaning (3:3, 27:25). There must be some limits, they say, some emphasis or focus. While it is true that "everything is connected," the study of everything is not EE unless the connections are made, ecologically-environmentally. The study of unemployment sans connections, is not EE. The study of unemployment, as a cause of environmentally deleterious makework projects, as a product of environmentally deleterious technology, is EE.

> Ultimately, we believe, EE must focus on the Spaceship Earth concept. It must deal with man-man or man-society relationships only as they affect, or are affected by, man-earth relationships. Other endeavors, worthwhile though they may be, are not EE. To be useful, a concept must be both inclusive and exclusive.

Swanson (1975) suggests that "environmental problems arise because man is somewhere in the picture, and they must be defined in terms of man. . . . I believe that every environmental problem is, first and foremost, a problem of values; all other aspects are secondary."

Expected Outcomes

Stapp, et al. (1969) in an often cited paper, lay out some of the fundamental positions which have been reiterated by a number of others. Stapp's definition of environmental education was cited earlier in this study and it became the basis for much later work, and the same is true for other positions taken in this article, such as the following:

> Most current programs in conservation education are oriented primarily to basic resources; they do not focus on community environment and its associated problems. Furthermore, few programs emphasize the role of the citizen in working, both individually and collectively, toward the solution of problems that affect our well being. There is a vital need for an educational approach that effectively educates man regarding his relationship to the total environment.

Stapp specifies that "the major objectives of environmental education are to help individuals acquire:

1. A clear understanding that man is an inseparable part of a system, consisting of man, culture, and the biophysical environment, and that man has the ability to alter the interrelationships of this system.
2. A broad understanding of the biophysical environment, both natural and man-made, and its role in contemporary society.
3. A fundamental understanding of the biophysical environmental problems confronting man, how these problems can be solved, and the responsibility of citizens and

government to work toward their solutions.

4. Attitudes of concern for the quality of the biophysical environment which will motivate citizens to participate in biophysical environmental problem solving. (All underlined in original)

The Committee on Resources and Man (1969) lists and explains 26 recommendations related to the man-environment relationship which reflect the "Spaceship Earth" position, particularly as specified in Bates (1969). The recommendations are arranged into four categories: (1) early action, (2) policy, (3) research, and (4) organization.

Hawkins (1970) suggests that "an environmental ethic is first of all a very deep moral commitment. . . The first and most important step toward an ideal environmental ethic is to face the question of man's relationship with other living things and to the physical environment." She points out a difficulty in developing such an environmental ethic is that each person already has a set of attitudes and values under which decisions are made. "Any attempt to develop a new ethic will have to take these constraints into account. Moreover, to be viable, an environmental ethic must be shared by most of the human species."

Bryson (1970) suggests that "the educational system must have a mandate to develop a commonly held body of knowledge about the whole man-environment system so a national environmental ethic can emerge."

> We have felt that something significant was missing--the massive integrative effort to combine the bits and pieces of research into a broad understanding of the total man-environment system, in all its biological, physical, social and cultural aspects.
>
> New curricula aimed at environmental understanding and ecological awareness should not be composed of "shopping lists" of traditional courses and subjects, for the lack of integration of discipline-oriented courses and research is probably the most important reason for the general lack of understanding of man as an integral element of a complex system. It is clear that a prime purpose of education is to

> help the citizen discover who he is and how he relates to the rest of the world. Integrative environmental curricula, properly designed, can do much to alleviate the general failure of traditional curricula to achieve this goal.

Nixon (1970) specified that

> It is also vital that our entire society develop a new understanding and a new awareness of man's relation to his environment--what might be called "environmental literacy." This will require the development and teaching of environmental concepts at every point in the educational process.

Kormondy (1971) observed that environmental education is leading to a resurgence of the liberal arts and a "rebirth of the whole man."

Linsky (1971) takes the position that each person must learn to accept responsibility for the pollution of the environment. "Our very survival depends on the inculcation of an attitudinal ethic that will provide a positive pivot for survival." Specifically, Linsky asks that human behavior be evaluated in terms of eight basic values: respect, power, wealth, enlightenment, skill, well-being, rectitude, and affection.

Clark (1969) states that "each phase of any such program needs to help the person build an attitude of understanding and responsibility--personal, individual responsibility--towards the total environment."

Hill and White (1969) suggest that "a high priority is essential for educational programs that deal with new developments and problems related to man and the new technology." They go on to point out that citizens must become aware of natural resources, and that children in particular must gain an appreciation of the resources as well as knowledge. Further, it is suggested that conservation activities may become a way of life through skills developed through participation in school ground and neighborhood conservation programs.

> Each child has a role to play in these problem solving activities. . . . The educational community can, and must,

> provide action oriented programs of environmental education for young people. (Emphasis in original)

Peterson (1972) argues for the environmental generalist, who has (a) capabilities of assessing environmental deficiencies, (b) taken general and specialized training, (c) experienced interdisciplinary interaction, (d) analyzed environmental problems from several viewpoints, (e) suggested action oriented solutions to problems, and (f) been prepared to assume leadership in environmental problem-solving. Such a program must be interdisciplinary and use innovative approaches.

Caldwell (1970) suggests that environmental quality in the future depends on "shaping of attitudes, beliefs and values through present education." He goes on to point out that America has no "corpus of ecological doctrine in our public life comparable to that which now influences or governs our economic decisions."

Brennan (1970) suggests that a major assumption in developing a strategy for environmental quality education should be that consequences of actions should be considered an essential element in human understanding. Environmental education involves two parts, development of understanding and the development of attitudes for a conservation ethic.

The Editor (1970a) of the Journal of Environmental Education (Clay Schoenfeld) suggests that in the search for environmental quality "we need new integrated programs that will discover, disseminate, and apply the ecological and economic facts, engineering techniques, and esthetic appreciations basic to an applied conservation conscience." He goes on to say that environmental education has the following needs: new knowledge and new knowledge seekers to produce more information; more and better professionals to apply the knowledge; citizen education to produce a "mass conservation literacy;" technical council and services available to all levels; and a federal role particularly through funds.

Hare (1970) divides the short-term from long-term considerations. For the short-term, he cites the Tukey Report of 104 recommendations for action and suggests this is a good place to start. For the long-term, he suggests there are different environments to be dealt with: (1) natural environment, (2) social environment, (3) built environment, and (4) the total environment or 1 + 2 + 3. Further, he suggests that the university should study all the environments; that the framework be ecological in the largest sense; that the social sciences and psychology play a major role in environmental studies; that political action is necessary; and that we realize that we are operating within a Western philosophy.

C. Roth (1971) states that:

> Environmental education is an integral part of a basic education. Interdisciplinary in nature, it stresses those aspects of each so-called discipline that contributes to basic perception of, understanding of, and concern for the fundamental interactions of man and his total environment--that is, both natural and man-made.
>
> Environmental education strives for ecological, economic, social, and political awareness; problem solving skills and individual responsibility to prepare students for responsible action and leadership in dealing with environmental problems now and in the future.
>
> For basic understanding, environment is limited to the surroundings of whole organisms. The key organism is seen to be man and every effort is made to sharpen and define our understanding of the qualities of the environment that enhance individual and collective well-being. Environmental education seeks to produce environmentally literate citizens, that is, citizens properly informed to be able to read their environment, diagnose its ills, apply first aid when needed, and bring in experts to handle the more complex problems.

For Roberts and Dyrli (1971), awareness is a key element and educational programs at any level should begin with awareness of the problem to be solved; awareness will lead to a need for knowledge. Also, emphasis should be placed on active involvement in the total environment and the total educational enterprise. The goal is to develop a comprehensive value system based on a genuine environmental literacy. The program must be carried out on all academic levels.

At the preschool and elementary levels, the programs would be primarily experience and skill development centered. The program should include opportunities for quantitative work, group interaction and social development, environmental information from a variety of sources, aesthetic development and physical education through interaction with appropriate aspects of the environment.

At the middle and secondary school level, they suggest the following: (1) initiation of a multidisciplinary program; (2) opportunity to work on ecological projects; (3) opportunities to refine process skills and value systems; and (4) courses or programs for students who want to develop technical skills.

Boyer (1974) suggests that schools should help students:

1. Develop an environmental awareness.
2. Learn to practice an environmental ethic.
3. Understand the limits of individual responsibility and the need for collective action.
4. Understand the characteristics of a global steady state system.
5. Distinguish between a static and a dynamic steady state system.
6. Design features based on integrated ecological and social planning.
7. Identify public policy transition steps toward a just dynamic, steady state system.

8. Participate in the political action necessary to help effect new policy.

Agne and Nash (1974) point out that

> We believe that E2 [environmental education] programs will have both short- and long-range effectiveness only when they raise a student's personal and political consciousness and only when they provide him with the personal and professional skills and knowledge to transform his life. Any curricular purpose less than this is vulnerable to the charge of fraudulence.

Lamb (1975) points out

> an assumption of many environmental educators is that exhibited by Roberts and Dyrli (10) who would "increase the environmental literacy of all students resulting, hopefully, in positive changes in behaviour." As Stapp (12) points out, however, research in education does not support the optimistic assumption that acquisition of information and skills will lead to positive changes in social behavior. In short, if environmental educators want to help their pupils develop an environmentally sound value system, those educators must orient their teaching specifically toward such a value system.

Lamb goes on to point out the inherent dangers of teaching for the acquisition of values. He suggests that

> there is almost universal agreement among environmental educators regarding the necessity for developing in pupils some sort of environmental ethic which will insure that these pupils will use their knowledge and skills for resolving environmental problems.

A number of authors who hold this position are cited by Lamb.

Hungerford and Peyton (1976) take an in-depth look at environmental literacy. They divide the literacy components into three areas: cognitive knowledge, cognitive process, and affect. The specific components follow:

> Literacy Component I. Cognitive Knowledge.
>
> With respect to this component, environmental literacy can can be operationalized as a human being (citizen) who. . .
>
> 1. . . . has the knowledge of those ecological concepts which impinge on a thorough understanding of communities, ecosystems, and man as an ecological factor.

2. . . . is aware of major environmental issues and can communicate the ecological implications of those issues.

3. . . . is aware of how he/she personally interacts with the environment and the implications of these interactions. This would infer some sort of prior personal ecological impact assessment.

4. . . . has knowledge of the impact of man's cultural activities on the environment, e.g., business, industry, agriculture, government, consumer practices, religion, etc.

5. . . . has knowledge of the role played by differing human values in the creation of environmental issues and can communicate the need for value clarification as one step in the solution of environmental problems.

6. . . . has knowledge of and the ability to communicate the need for environmental action strategies, i.e., persuasion, legal action, political action, consumerism, and eco-management.

Literacy Component II. Cognitive Process.

With respect to this component, environmental literacy can be operationalized as a human being (citizen) who . . .

1. . . . has the ability to apply ecological principles to an analysis of and the remediation of environmental issues.

2. . . . has the ability to use both primary and secondary source inquiry strategies to obtain information on environmental issues, i.e., has an ability to utilize cognitive process in environmental problem solving.

3. . . . has the ability to use those skills inherent in environmental action strategies.

4. . . . has the ability to logically inspect personally-held values in the light of new information.

Literacy Component III. Affect.

With respect to this component, environmental literacy can be operationalized as a human being (citizen) who . . .

1. . . . has a desire to maintain an environmental perspective --or ethic--consistent with ecological stability, i.e., a willingness to strive for a homeostatic relationship with the biosphere.

2. . . . is willing to enter into the process of value clarification.

3. . . . is willing to use environmental action strategies in an effort to remediate environmental issues.

Several others who have specified the need for an environmental literacy and described characteristics, although not in the depth of the above quotation, would include the following: Ambry (1975); Brennan (1973); Brewer (1970); Brice (1972); Dambach (1969); Rentsch (1973); Sale and Lee (1972).

Rubin, et al. (1974) state

> Assuming that a broad public literacy of biological and ecological concepts is at the heart of defining, reclaiming, and maintaining environmental quality, the press should strive to create an awareness of environmental problems, and then seek to develop an understanding of underlying principles, issues, and answers.

Curriculum and Instruction

Jackson (1970) as a discussion leader for a Conservation Education Association Group, devised the following six major points to consider in developing environmental education curriculum materials:

1. Environmental conservation education must have an integrated curriculum approach.
2. If a well-integrated approach is taught effectively in grades K-12, then supplemental courses in Environmental Conservation Education might be offered.
3. Environmental Conservation Curriculum materials should have behavioral objectives.
4. Environmental Conservation Education materials should have a method of evaluating changes in behavior.
5. All adopted textbooks in all subject areas must be required to have environmental conservation principles incorporated throughout.
6. For Environmental Conservation Education curriculum material to be used effectively, in-service training must be conducted for teachers and administrators as well as pre-service training for all future teachers.

Stapp (1971) specifies that there are

> three major strategies for getting environmental education into the elementary and secondary curriculum: complete reform of the total curriculum; integration of environmental education into the existing curriculum; and development of special study units.

Peterson and Hall (1974) suggest that environmental education should be integrated with educational experiences in the social sciences, natural sciences, and others. The goal should be the education of citizens who will vote. They suggest that a team-teaching, interdisciplinary approach is needed.

Tanner (1974a) starts by stating that his notes contain references to nineteen sources which express the following position: "EE must be integrated into the existing curriculum at all grade levels and in all subjects. . . . Writers in the field are in virtually universal agreement that EE should be integrated into the entire curriculum."

Tanner goes on to suggest that both environmental content and process skills are important and that one needs the other in order to function. He indicates that sequence of environmental education activities may be a "non-issue" since it has received so little attention in the literature. In connection with this, the question of "good news" vs. "bad news" is of concern, i.e., what is the proper balance? Further, what is the relationship between, and proper balance in the curriculum of the cognitive and affective domains?

Controversial issues are another aspect of environmental education and may be handled by avoiding them, preaching a point of view, or by a balanced approach to each side. Tanner suggests the latter method using case study approaches.

Tanner suggests that many materials suggest that the students "do something," but fail to provide appropriate suggestions about what to do. "The EE curriculum should contain activities which provide the learner with more specific information and experiences regarding the things which he can do."

Tanner perceives that the concept of inquiry is misunderstood and misapplied by at least some educators. Tanner argues that to resolve this situation, it is critical to finish any investigation, not stop at the hypothesizing stage.

Morrissett (1975) reinforces Tanner's (1974) point about it being necessary to limit the scope of the problem area that environmental education deals with. Morrissett suggests there are three ways problem areas may be defined: commonality of causes, consequences, and solutions. Further, he suggests that most problems can be classified under four headings: pollution, resource management, conflict about life styles, and excessive population.

Morrissett then lists and describes the three major causes of environmental problems: spillovers or externalities, i.e., the side effects; patterns of resource ownership and decision-making; and value conflicts. He provides several examples of environmental problems and non-environmental problems to further reinforce the point that the "study of everything is not EE" (Tanner, 1974a).

Further supporting Tanner's position, Whitfield (1971) points out

> the integration of all knowledge must necessarily produce nonsense and meaninglessness; experience would consist of a profusion of undifferentiated impressions which could not in any real sense guide our behaviour.
>
> We must look to logically similar fields of activity for this integration.

Hare (1970) indicates he has given considerable thought to how environmental studies, particularly in the large university, should be organized. The point he makes over and over in the paper is the need for action and action-oriented programs. Instead of an interdisciplinary approach suggested by many others, he suggests a new kind of discipline which is synthesizing in method. As to scope, he suggests that it is difficult to specify since "without even trying you can relate nearly everything to the theme 'man and environment.'"

Hafner (1970) takes the position that it is inescapable that environmental science is interdisciplinary. But, he points out, mathematics, chemistry, and economics are interdisciplinary in the same way; therefore, like Hare (1970), Hafner suggests that it may simply be a matter of recognizing the new discipline of environmental science. He suggests the name "ecography" for the new discipline, but that while the name is really unimportant, the central theme is vital. "We are engaged in a study of facts and values which describe and control man's interaction with his habitat."

Voelker and Kolb (1973) state that there is

> clearly a need to promote the interaction and interdependence of the scientific and social aspects of environmental study. . . . The necessity of such cooperation is inherent in the interdisciplinary and value orientations of environmental decision-making.

They cite a number of works supporting the science-social approach, and the interdisciplinary approach.

Ambry (1975) suggests that environmental education curriculum should be:

1. interdisciplinary, using data and concepts from the social as well as the physical and biological sciences;
2. designed to meet the needs of teachers and students in urban areas;

3. organized around environmental problem areas providing teachers and students a wide variety of insights into problems related to science, society, economics, physical and psychological health, values, and group psychology associated with environmental problems;

4. provisioned with the opportunity to select from among alternatives, based on the exercise of critical skills and the clarification of values;

5. suitable for use in small group or individual instructional situations;

6. susceptible to rapid revision and updating of units.

Altman (1972) points out that "environmental education is interdisciplinary in nature. It involves subject matter from the natural sciences and the social sciences. . . . It is a fusion of subject matter (content) and inquiry skills (process)."

Klausner (1972) points out the language difficulties in an interdisciplinary science-social science overarching theory of the man-environment relationship. After considering several possible alternatives, he concludes a temporary way to skirt the dilemma is to hold one system constant while the other is manipulated.

Schoenfeld (1970) lays out a plan for a national environmental education program from the presidential to the local level. The rationale for the national program is that "it is unthinking people who pollute the environment, and it is thinking people who can bring about environmental conservation, redevelopment, and maintenance."

Processes and Procedures

Cummings (1973) argues that "there are a number of good reasons for conceptualizing environmental education around a model of decision-making." And, he argues, decision-making, like inquiry, can be integrated into existing subject matter without disrupting it. "Decision-making models provide a mechanism that integrates experiential learning and inquiry methods into a valuing process leading to action.

Berger (1956) examines group problem-solving. He specifies the following qualifications which are "essential to understanding of the group problem-solving processes:

1. The problem under consideration must be of real significance.
2. The problem under consideration must be of concern to diverse interests.
3. The problem must have geographical limits permitting easy study.
4. The problem must be resolved with some degree of satisfaction to local people.
5. It must be the consensus of outside specialists that the problem was well met.
6. The key figures in the problem must be available for questioning and willing to discuss at length their experiences, feelings, and insights.

Many significant characteristics of group problem-solving are listed in a list of 74 "observations on the nature of group problem-solving processes."

Knapp (1972) points out that there is no "best" way to change attitudes about the environment; however, a variety of methods have been successful in changing attitudes in some people, including:

> verbal reinforcement, counter-attitudinal role playing, debates, providing new information, introducing anxiety or fear arousing situations, understanding the psychological need for holding a particular attitude, changing certain social factors, adult models, behavior change precedes attitude change.

Sears (1972) suggests that a plan is necessary before anything is done to or for the environment. "Planning seeks not to justify projects but to identify and evaluate the consequences of alternative means for solving problems and satisfying needs." Sears proposes an environmental and ecological inventory for regional environmental situations, utilizing four classifications: historical and archeological, visual, ecological, and land use (cultural).

Burns and Brooks (1970) deal with the question, "What are the educational processes?" They point out that educational processes are "mental skills used by learners in learning, in using learned products, and in communicating about things learned." They provide a list which contains examples of processes which do not overlap with each other. They also point out that each process term listed "is in reality a category name for a subgroup of synoptic or highly correlated terms." Their list follows:

1. Abstracting
2. Analyzing
3. Classifying
4. Conceptualizing
5. Equating
6. Evaluating
7. Generalizing
8. Inferring
9. Ordering
10. Sequencing
11. Simulating
12. Synthesizing
13. Theorizing
14. Translating

> How do processes relate to other educational end products? If one refers to the cognitive entities as type I objectives and the affective entities as type II objectives then processes or transformational entities are type III objectives. A fourth type of objective, heuristic entities, is called strategies. Processes are mental skills used in handling, dealing with, or transforming information, using the latter term broadly. Type I and type II objectives are learned behaviors which can be thought of as input in a computer analogy, while the processes are the separate treatments applied to the input by the computer. The specific sequence of treatments is the program or the strategy. The output is the solution of the problem.

Concepcion-Medel (1974) lists a number of process skills, including the following: observing, predicting, measuring, hypothesizing, testing, counting, measuring, classifying, inferring, defining operationally, controlling variables, communicating, identifying, recording, interpreting, collecting, examining, and comparing. Concepcion-Medel cites several references to make the following point--content and process must interact, i.e., "the processes cannot stand alone, they must of necessity deal with facts, built up to an understanding of the concepts."

Paradigms of Environmental Education in the Literature

Paradigms were collected from a number of different sources. Subsequently, they were examined for a dominant theme or purpose which would permit the various paradigms to be grouped logically. The researcher identified the following categories: subject-matter relationships, processes/procedures, man-environment interaction, curriculum, comprehensive, and evaluation.

The evaluation paradigms for environmental education are essentially the same as for other types of educational endeavors; therefore, they will not be reproduced in this study. In no way should this be inferred as a lack of need for evaluation. On the contrary, it is critical if better programs, materials, and so forth are to be developed. Sources of evaluation paradigms include: Bennett (1975); Gargasz (1973); Howell and Warmbrod (1974); Passineau (1974); and Taylor and Cowley (1972).

Paradigms representing each of the five categories listed in paragraph one above (i.e., excluding the evaluation category) will be arranged essentially in a chronological order by publication date. This arrangement, rather than by overall chronological order or some other method such as identification of a sub-dominant theme within the category, was selected specifically to determine whether evolutionary trends are present.

Each of the five categories of paradigms of environmental education will be introduced by a brief explanation of the characteristics of the category. Paradigms of that category will follow the introduction in chronological order. No attempt will be made to summarize the paradigms. Trends, should they emerge, will be discussed in Chapter V under the heading "Conclusions."

Since this is a rather lengthy section of Chapter II, the portion of the table of contents reflecting its arrangement is reproduced below.

Man-environment relationships pp. 66-80
Processes/procedures pp. 81-98
Subject-matter relationships pp. 99-104
Curriculum pp. 105-122
Comprehensive pp. 123-126

Man-Environment Relationship Paradigms

The man-environment relationship is a stated or implied component of nearly every reference to environmental education. Therefore, the man-environment relationship component is expressed or implied in most of the other paradigms in other categories. The paradigms in this category are separated from the others by a primary focus on that relationship and the components making up the relationship. By dealing specifically with this primary characteristic, paradigms in this sub-section lay the foundation for later developments.

Naylon (1970) (Figures 1 & 2). Naylon suggests that

> too many programs focus on single strands of the web of environmental relationships of man-land problems. Educators need a generalized community model for environmental studies. Because of variables within and between communities, the model to be developed must include both social and ecological subsystems. It must permit the learner to investigate real environmental problems in their actual social context. To be meaningful, it must also cause the learner to make decisions that are based on his findings (figs 1 and 2).
>
> Participation in this kind of program can promote "environmental literacy" through continued exposure to underlying principles and concepts presented within the matrix of the learner's immediate experience.

Roth (1971) (Figure 3). This model contains "the basic pieces of an environmental management curriculum." Based on Roth's study of the basic concepts of environmental management education (which will be examined in the conceptual frameworks section of this chapter), the model has "P" in the center which Roth indicates can stand for "prople" or for "problems." Roth lists concepts for each component in the model.

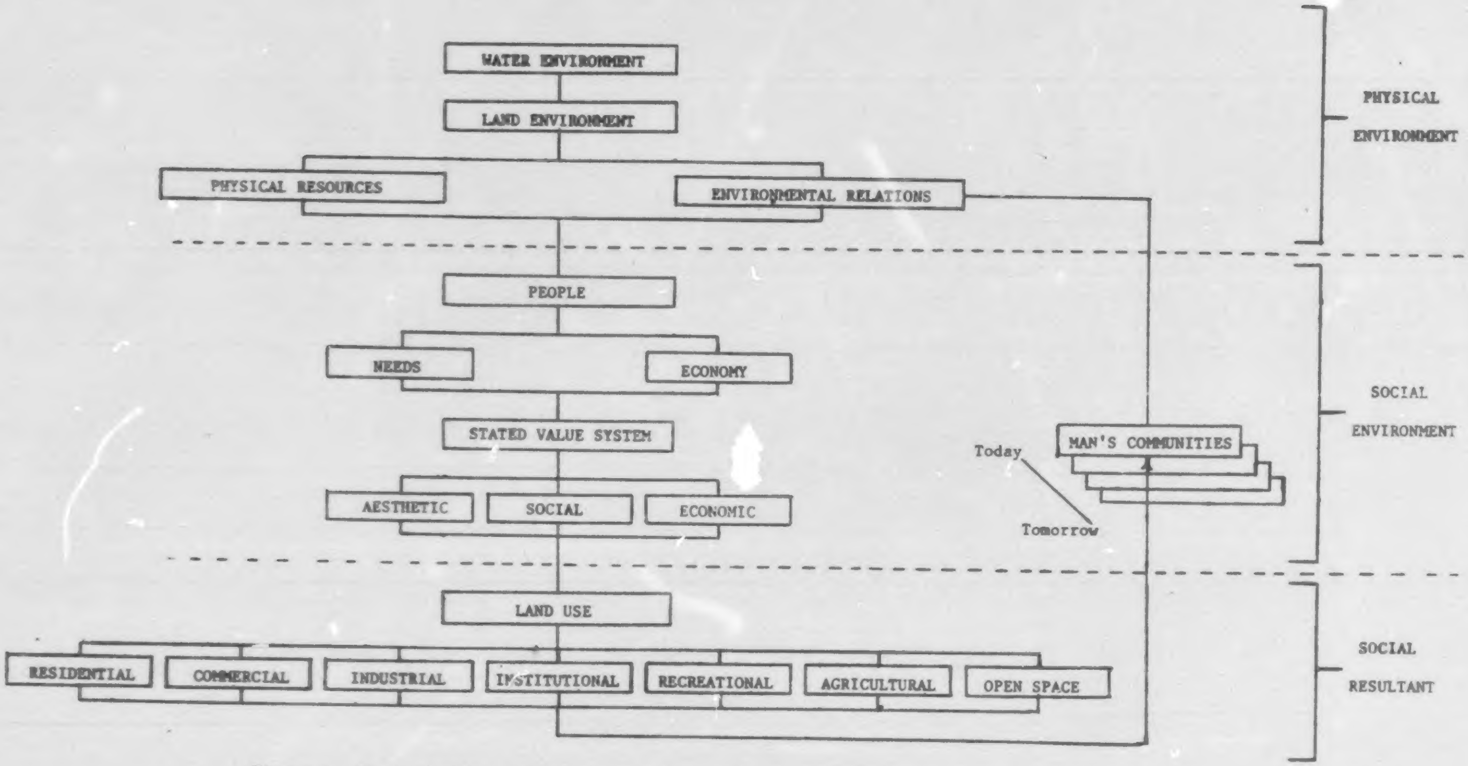

WATER ENVIRONMENT
LAND ENVIRONMENT
PHYSICAL RESOURCES
ENVIRONMENTAL RELATIONS
PEOPLE
NEEDS
ECONOMY
STATED VALUE SYSTEM
AESTHETIC
SOCIAL
ECONOMIC
MAN'S COMMUNITIES
Today
Tomorrow
LAND USE
RESIDENTIAL
COMMERCIAL
INDUSTRIAL
INSTITUTIONAL
RECREATIONAL
AGRICULTURAL
OPEN SPACE
PHYSICAL ENVIRONMENT
SOCIAL ENVIRONMENT
SOCIAL RESULTANT

Figure 1. Naylon (1970). "Schematic representation of the interaction between man and the environment. It focuses on land use as one method of examining our utilization of the environment. Use of land affects ecologic relations; these in turn affect society. The impact can be beneficial or it can result in general deterioration of environmental quality."

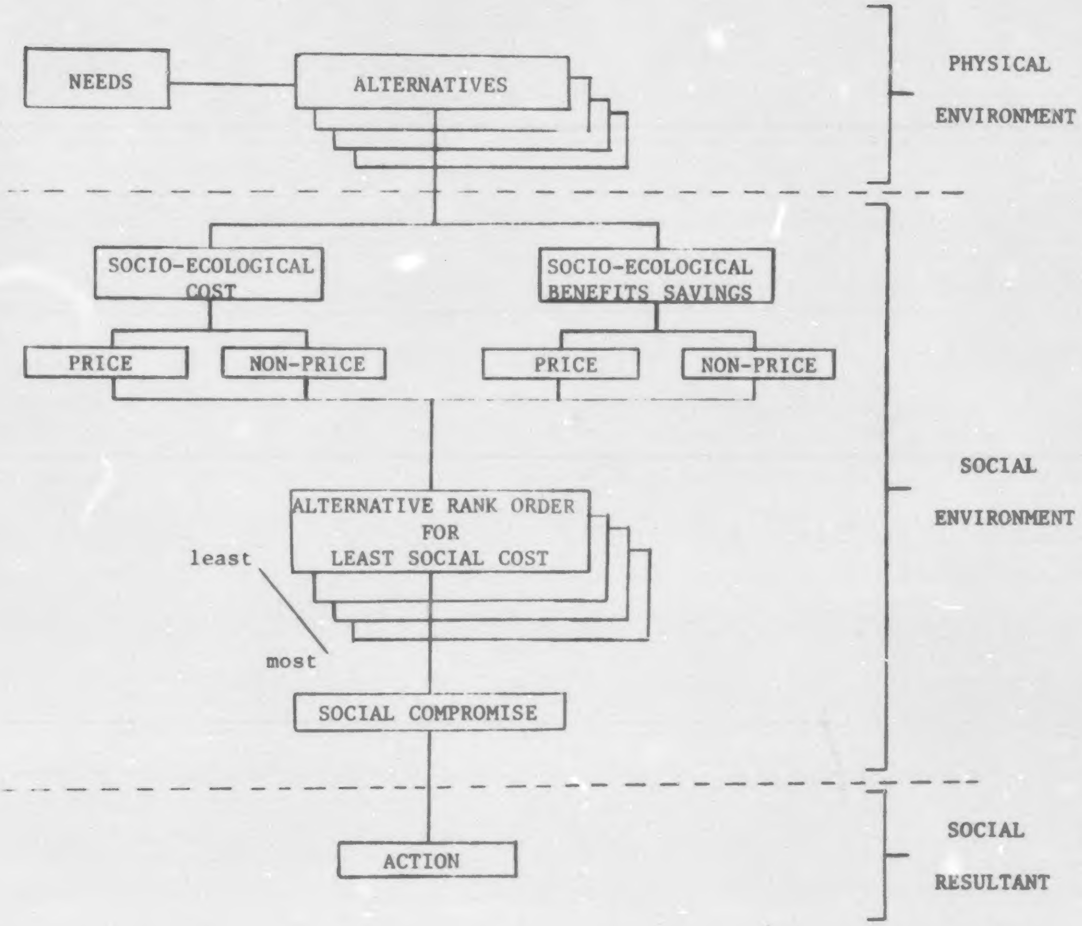

NEEDS
ALTERNATIVES
PHYSICAL ENVIRONMENT
SOCIO-ECOLOGICAL COST
SOCIO-ECOLOGICAL BENEFITS SAVINGS
PRICE
NON-PRICE
PRICE
NON-PRICE
SOCIAL ENVIRONMENT
ALTERNATIVE RANK ORDER FOR LEAST SOCIAL COST
least
most
SOCIAL COMPROMISE
ACTION
SOCIAL RESULTANT

Figure 2. Naylon (1970). A method of considering least community cost for social action to satisfy community needs. It brings society and ecology together in decision-making. It also recognizes the political process of social compromise.

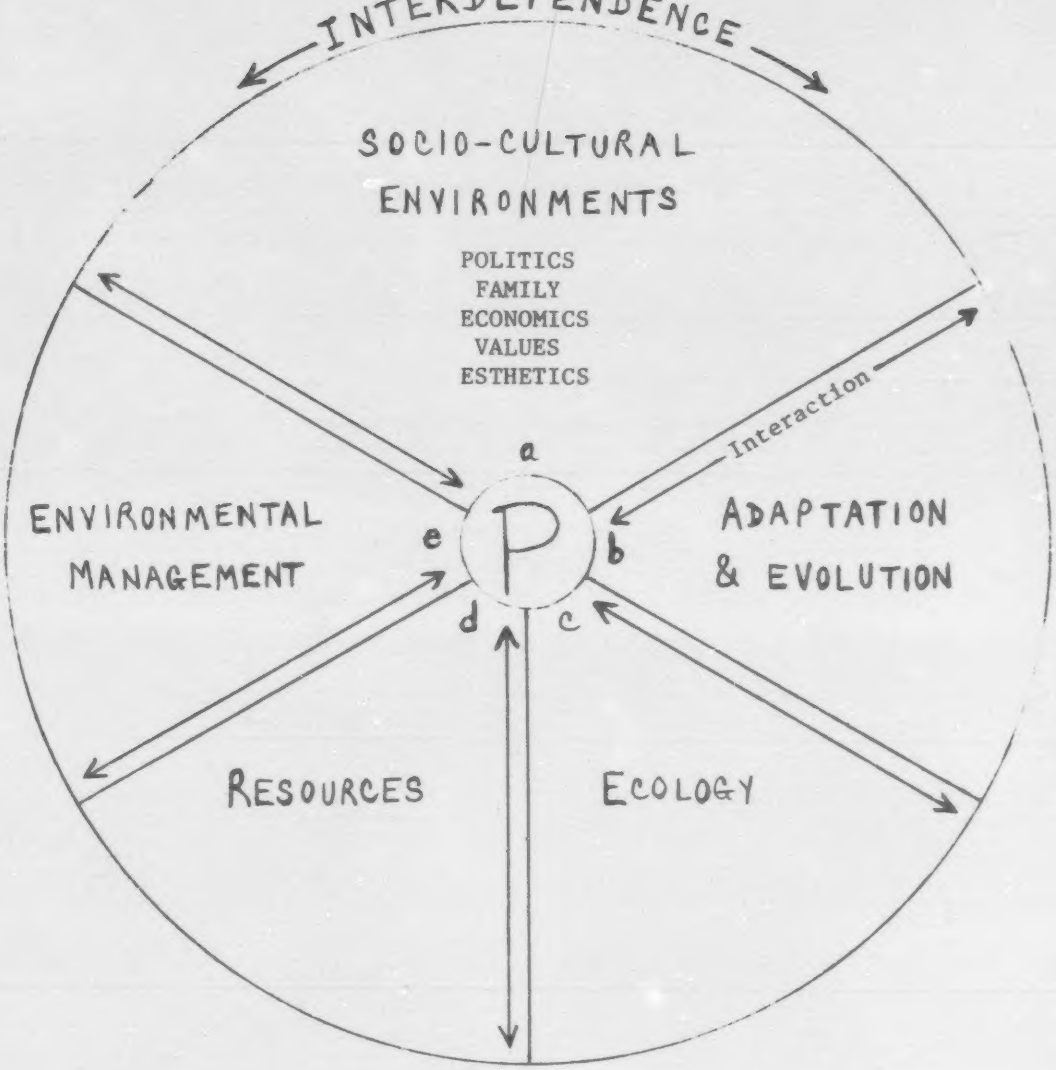

INTERDEPENDENCE
SOCIO-CULTURAL ENVIRONMENTS
POLITICS
FAMILY
ECONOMICS
VALUES
ESTHETICS
Interaction
a
b
c
d
e
P
ADAPTATION & EVOLUTION
ECOLOGY
RESOURCES
ENVIRONMENTAL MANAGEMENT

Figure 3. Roth (1971).

Roth (1972) (Figure 4). Roth states that "I suggest we recognize both the biophysical and the sociocultural environments. The definition suggested here also is an attempt to change the emphasis of man and his environment to that of the environment and man."

"Man is reduced from the role of 'dominant' or 'master' in the Judeo-Christian ethical sense to a lower state of existence. He is a part of the environment."

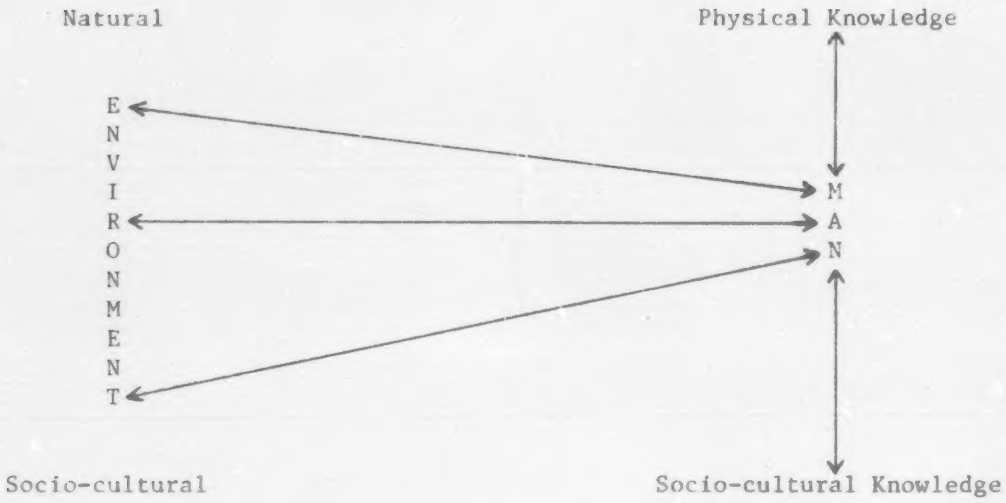

Natural
Physical Knowledge
ENVIRONMENT
MAN
Socio-cultural
Socio-cultural Knowledge

Figure 4. Roth (1972).

Bowman (1972) (Figures 5 & 6). The paradigms developed by Bowman are similar to Roth (1973) (Figure 8).

> The four major areas (represented by circles) were adapted from the Stapp et al. (1969) definition of environmental education. . . . Generally, environmental education refers to the understanding of the bio-physical and socio-cultural environments of which man is a part, increasing the awareness of the alternatives and management concepts (environmental management) and recognizing both evolutionary and man-made change as factors relevant to the decision-making process. The continuum works on the assumption that through increased understandings of the bio-physical, socio-cultural, management alternatives and change concepts, higher quality environmental decisions are possible.

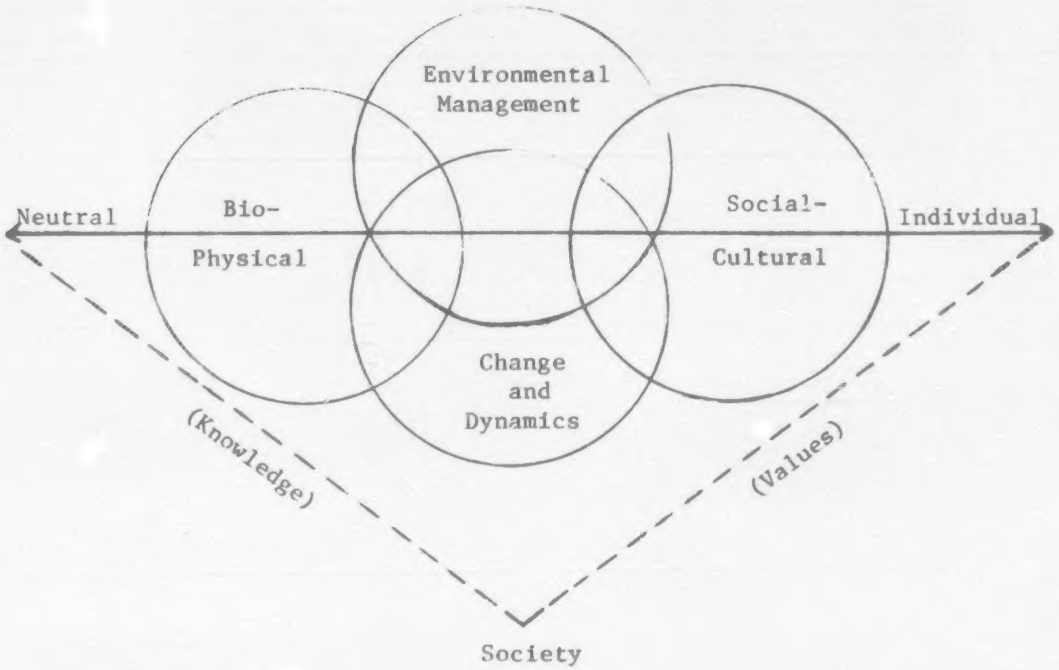

Environmental Management
Neutral
Bio-Physical
Social-Cultural
Individual
Change and Dynamics
(Knowledge)
(Values)
Society

Figure 5. Bowman (1972).

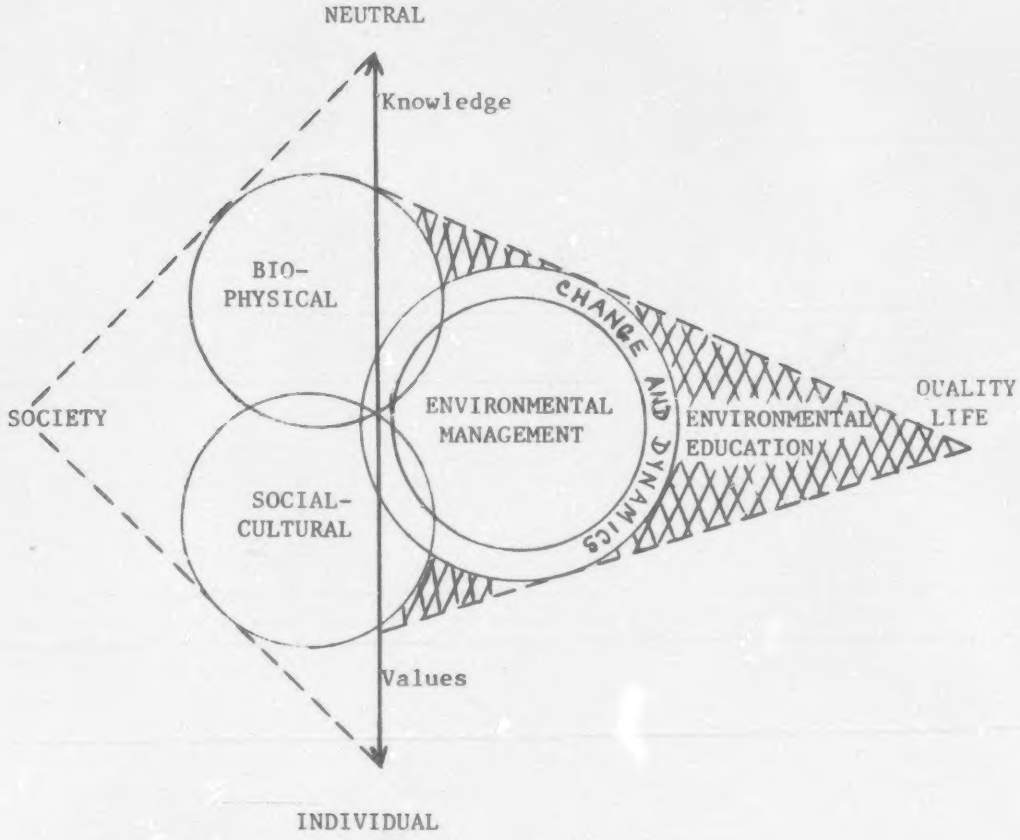

NEUTRAL
Knowledge
BIO-PHYSICAL
SOCIETY
SOCIAL-CULTURAL
ENVIRONMENTAL MANAGEMENT
CHANGE AND DYNAMICS
ENVIRONMENTAL EDUCATION
QUALITY LIFE
Values
INDIVIDUAL

Figure 6. Bowman (1972).

Hamann (1972) (Figure 7).

The writer interprets the model in the following manner: Environology is a value-oriented approach to, and is the study of the influences between Ecology and Technology examined through the Valuing Process by value systems and value institutions, and results in a continuum of environmental status, which at its low synergistic pole, leads to pollution and extinction, and at the high synergistic pole, leads to conservation and preservation. As an outcome of this education, the individual's terminal behavior will be measured on a continuum which reads from destructive action, apathy, awareness, concern, to constructive action, depending on how effectively the behavioral objectives of environmental education were met and how deeply the individual committed himself to the goals.

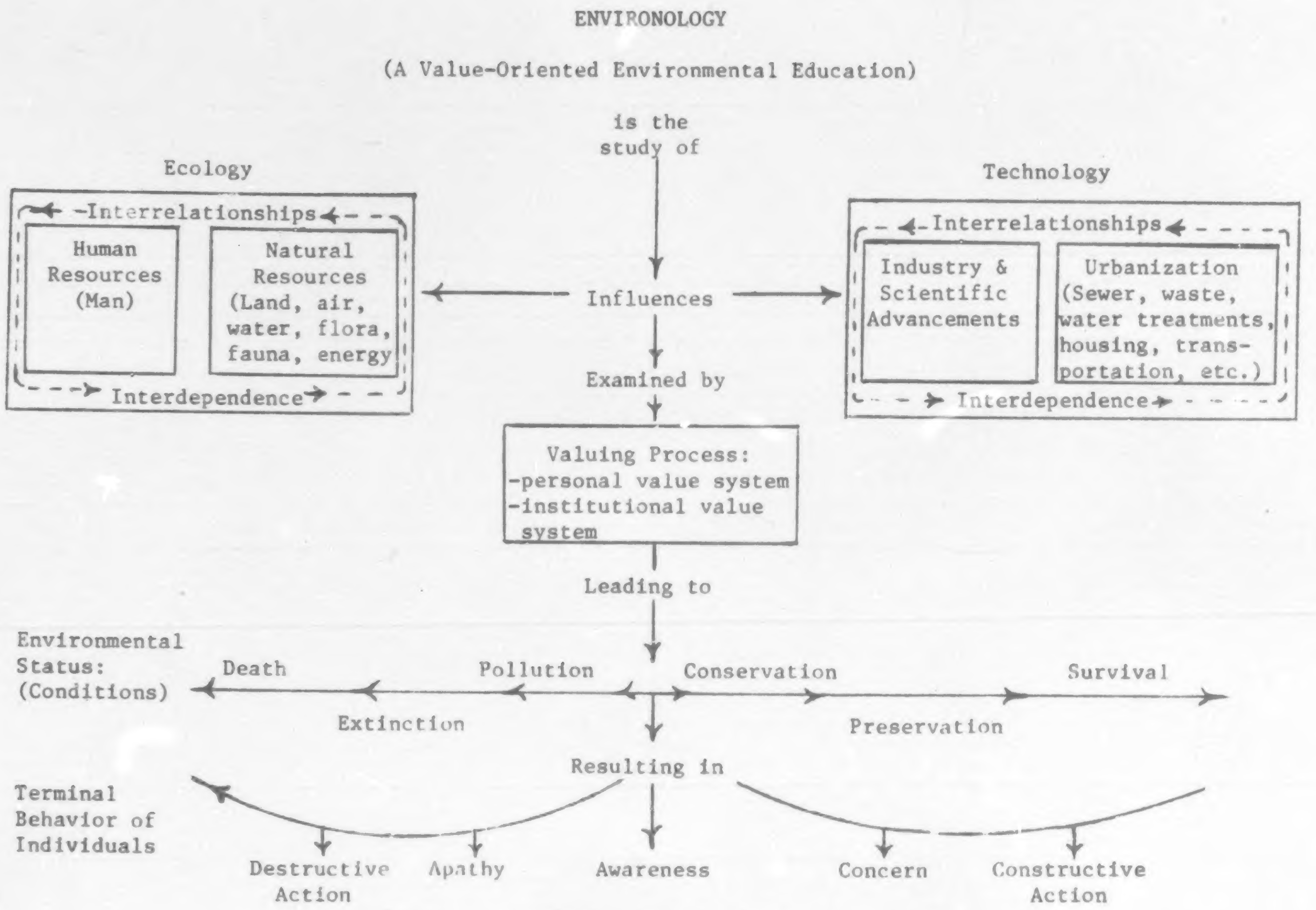

ENVIRONOLOGY
(A Value-Oriented Environmental Education)
is the study of
Ecology
-Interrelationships
Human Resources (Man)
Natural Resources (Land, air, water, flora, fauna, energy
Interdependence
Technology
Interrelationships
Industry & Scientific Advancements
Urbanization (Sewer, waste, water treatments, housing, transportation, etc.)
Interdependence
Influences
Examined by
Valuing Process:
-personal value system
-institutional value system
Leading to
Environmental Status: (Conditions)
Death
Pollution
Conservation
Survival
Extinction
Preservation
Resulting in
Terminal Behavior of Individuals
Destructive Action
Apathy
Awareness
Concern
Constructive Action

Figure 7. Hamann (1972).

Roth (1973) (Figure 8). Roth offers a model "as a focus for further discussion and exploration, as a guide in the development of environmental education curricula, and as an organizer for continued research."

> The four conceptual schemes for each of the four areas are as follows:
>
> 1. Biophysical--Living things are interdependent with one another and the environment.
>
> 2. Socio-cultural--The relationship between man and the environment are mediated by culture.
>
> 3. Environmental Management--The management of resources to meet the needs of successive generations demands long range planning.
>
> 4. Change--Organisms and environment are in constant change.

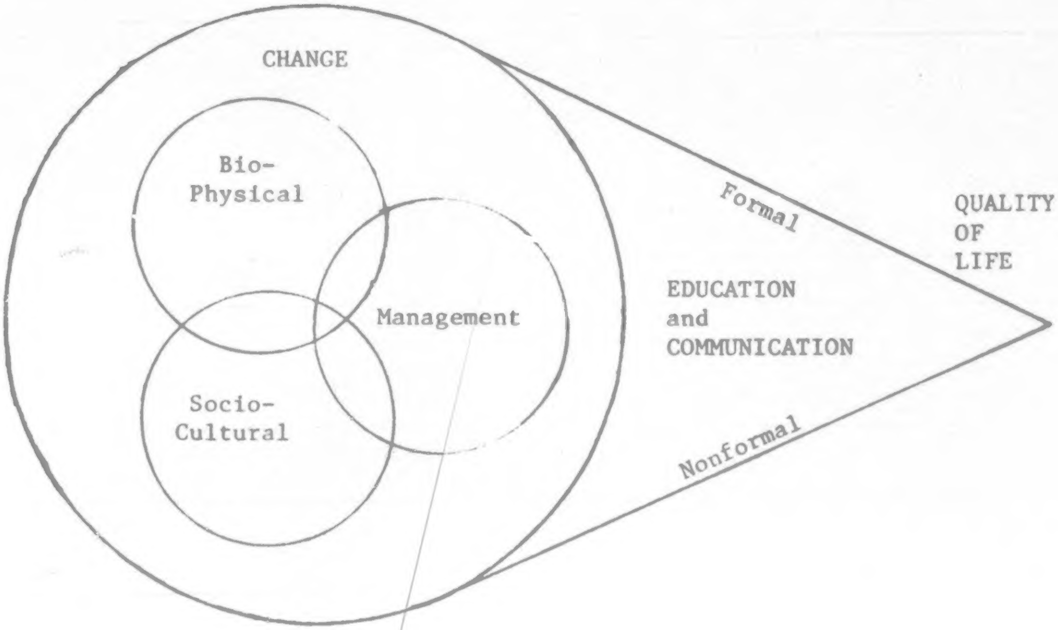

CHANGE
Bio-
Physical
Management
Socio-
Cultural
Formal
Nonformal
EDUCATION
and
COMMUNICATION
QUALITY
OF
LIFE

Figure 8. Roth (1973).

Burton, Kates, & Kirkby (1974) (Figure 9).

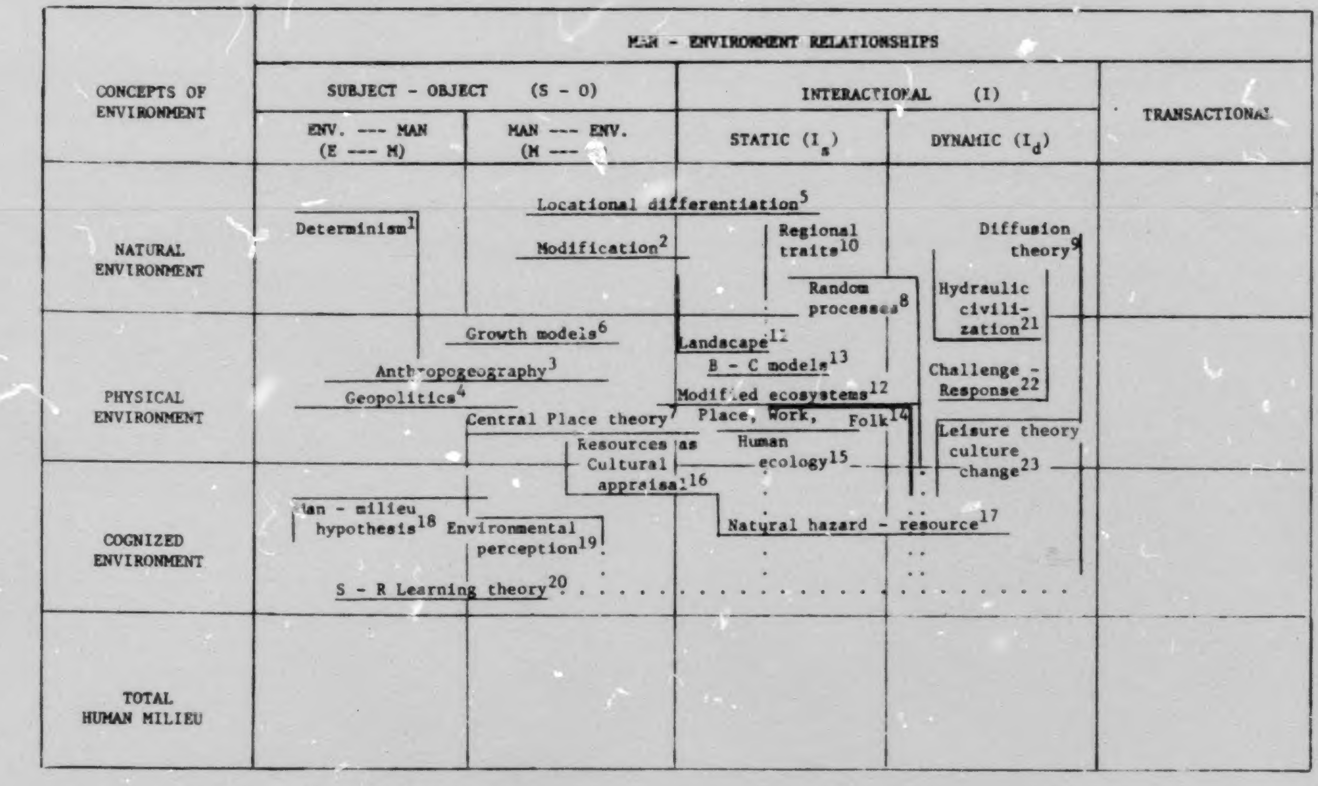
> To make the environment comprehensible without making it human and to comprehend humans without atomization is the challenge implicit in man-environment theory. In the spirit of the cognitive reformation, our preference is to focus on how men understand their relationship to environment, the cognition not of environment or men but of the form of the relationship between them. And in the spirit of our long empirical and inductive tradition, our preference is to turn to the richly variegated geographic lore for the systematic comparison across societies and environments of such cognized relationships.

Podewell (1975) (Figure 10).

> Ecosystems begin with ENERGY, which drives our wind and water cycles, and which green plants convert to FOOD to sustain all of the planet's organisms. Energy and food are both needed for EVOLUTION to proceed, resulting in POPULATIONS of hundreds of thousands of species organized in complex COMMUNITIES. Ecosystems consist of a host of simultaneous INTERACTIONS within and among these communities in a dynamic equilibrium known as the BALANCE of nature.
>
> Human systems begin with ENERGY, which fuels our industrial processes and makes possible mass AGRICULTURE. Free to evolve an expanding TECHNOLOGY, including disease prevention, our POPULATIONS have multiplied. Our rapidly growing COMMUNITIES, with their numerous manufacturing, transportation, and communications systems, create a network of global INTERACTIONS which threaten ecosystem stability. Increased understanding of both ecosystems and human systems, and a careful examination of human values are now required to preserve the BALANCE of our communities and the environments which sustain them.

Archbald and McInnis (1975) (Figure 11). They present a paradigm which is strikingly similar to Podewell's (1975).

> A survey of professional ecologists in early 1974 indicated that the basic functions of the natural environment can be understood in terms of interrelationships among seven concepts: ENERGY, FOOD, EVOLUTION, POPULATION, COMMUNITY, INTERACTIONS and BALANCE. . . . This book presents a frame of reference that employs these concepts in a unified perspective on both natural and human systems.


MAN - ENVIRONMENT RELATIONSHIPS
CONCEPTS OF ENVIRONMENT
SUBJECT - OBJECT (S - O)
INTERACTIONAL (I)
TRANSACTIONAL
ENV. --- MAN (E --- M)
MAN --- ENV. (M --- E)
STATIC (I_s)
DYNAMIC (I_d)
NATURAL ENVIRONMENT
PHYSICAL ENVIRONMENT
COGNIZED ENVIRONMENT
TOTAL HUMAN MILIEU
Locational differentiation5
Determinism1
Modification2
Regional traits10
Diffusion theory9
Random processes8
Hydraulic civilization21
Growth models6
Landscape11
Anthropogeography3
B - C models13
Challenge - Response22
Geopolitics4
Modified ecosystems12
Central Place theory7
Place, Work, Folk14
Leisure theory culture change23
Resources as Cultural appraisal16
Human ecology15
Man - milieu hypothesis18
Environmental perception19
Natural hazard - resource17
S - R Learning theory20

A Matrix of Man-Environment Relationships

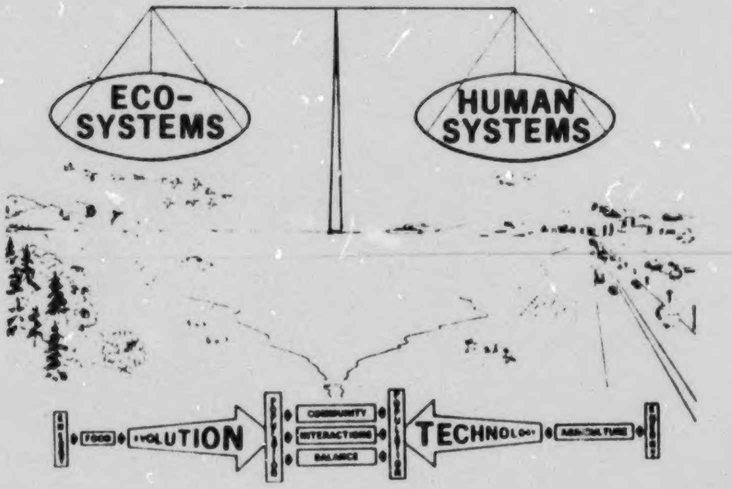

ECO-SYSTEMS
HUMAN SYSTEMS
FOOD
EVOLUTION
COMMUNITY
INTERACTIONS
BALANCE
TECHNOLOGY
AGRICULTURE

Figure 10. Podewell (1975).

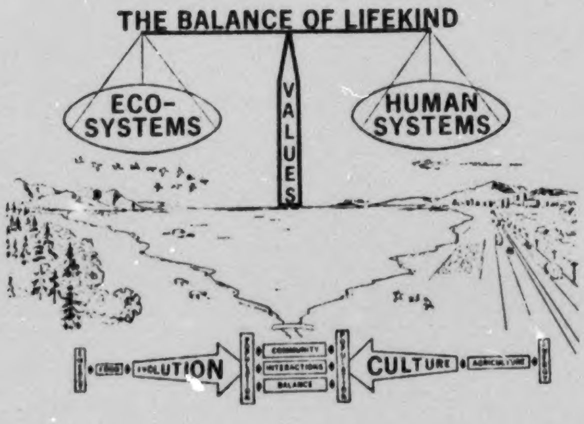

THE BALANCE OF LIFEKIND
ECO-SYSTEMS
VALUES
HUMAN SYSTEMS
FOOD
EVOLUTION
COMMUNITY
INTERACTIONS
BALANCE
CULTURE
AGRICULTURE

Figure 11. Archbald & McInnis (1975).

Bennett (1975) (Figure 12).

The earth is a closed and finite system having a structure of living and non-living components which function in the cycling of matter and flow of energy. Each component has characteristic interrelationships, and changes which tend to produce a condition of stability. The greater the stability of a natural ecosystem the greater its ability to survive.

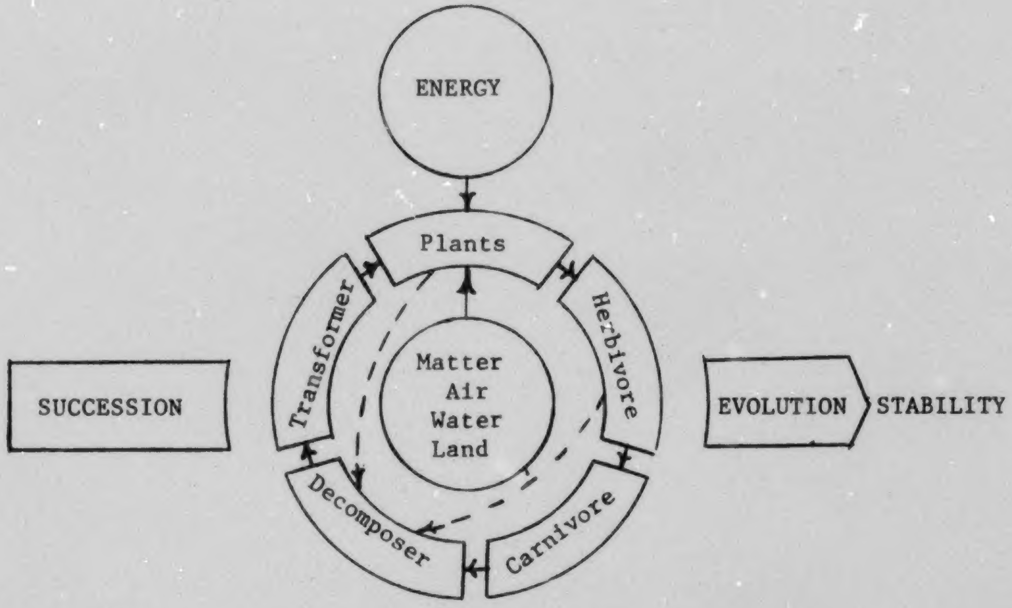

ENERGY
Plants
Transformer
Herbivore
Matter
Air
Water
Land
Decomposer
Carnivore
SUCCESSION
EVOLUTION
STABILITY

Figure 12. Bennett (1975).

Bennett (1975) (Figure 13).

People are dependent on the natural environment but have the ability to alter it to meet their physical psychological, and social needs and wants. The human environment is produced by human resources working through institutional and technological systems to utilize natural resources. Environmental problems result when there is a lack of recognition and response to existing and future conditions which threaten natural ecosystem stability and the fulfillment of human needs.

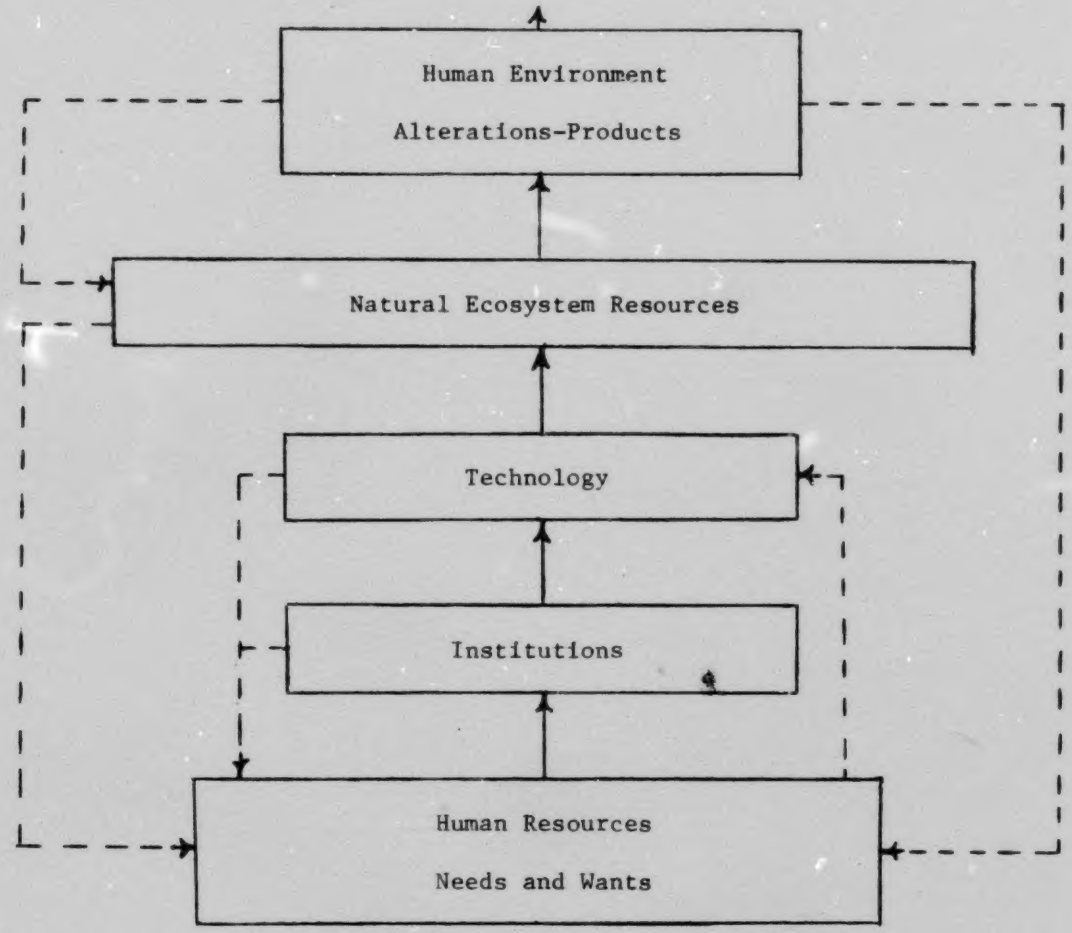

Human Environment
Alterations-Products
Natural Ecosystem Resources
Technology
Institutions
Human Resources
Needs and Wants

Figure 13. Bennett (1975).

Processes/Procedures Paradigms

As the title suggests, paradigms in this sub-section deal with processes and procedures under a variety of different headings. Each paradigm uses individual terminology and no attempt has been made to revise for consistency. In general, paradigms in this sub-section will deal with decision-making, problem-solving, specific methods of interacting, planning strategies, values, issue investigation, action strategies, and specific activities. Many will offer a specific sequence of steps to achieve the aim or the goal of the paradigm.

Sehgal (1970) (Figure 14).

> As shown in the figure, resources can be thought of as physical-technological and biological. . . . [Man] has to understand that (i) the resources of this planet are limited and exhaustable; (ii) technology, through substitution and synthesis, can play only a minor role; (iii) the capacity of the environment to act as a sink for all the waste he produces is limited, if living organisms are not to suffer; and (iv) environmental management is really synonymous with management of man himself.

Sehgal (1970) (Figure 15).

> As a society deliberates the options open to it, several factors, shown in figure [15], come into play. The resources of each society being finite, priorities have to be established. Involvement of the people and their leadership becomes increasingly important. Conflict of interest among segments of the society has to be resolved without causing undue burdens and hardships. Once a commitment is made, certain sacrifices, risks, and rewards follow. In a democracy, for example, the decision itself has to be based upon the will of the majority rather than the vested interests. As progress is made, the future course can be corrected in the light of new data and experience. The cost of a certain program of action is borne by the consumer and the taxpayer, directly or indirectly.

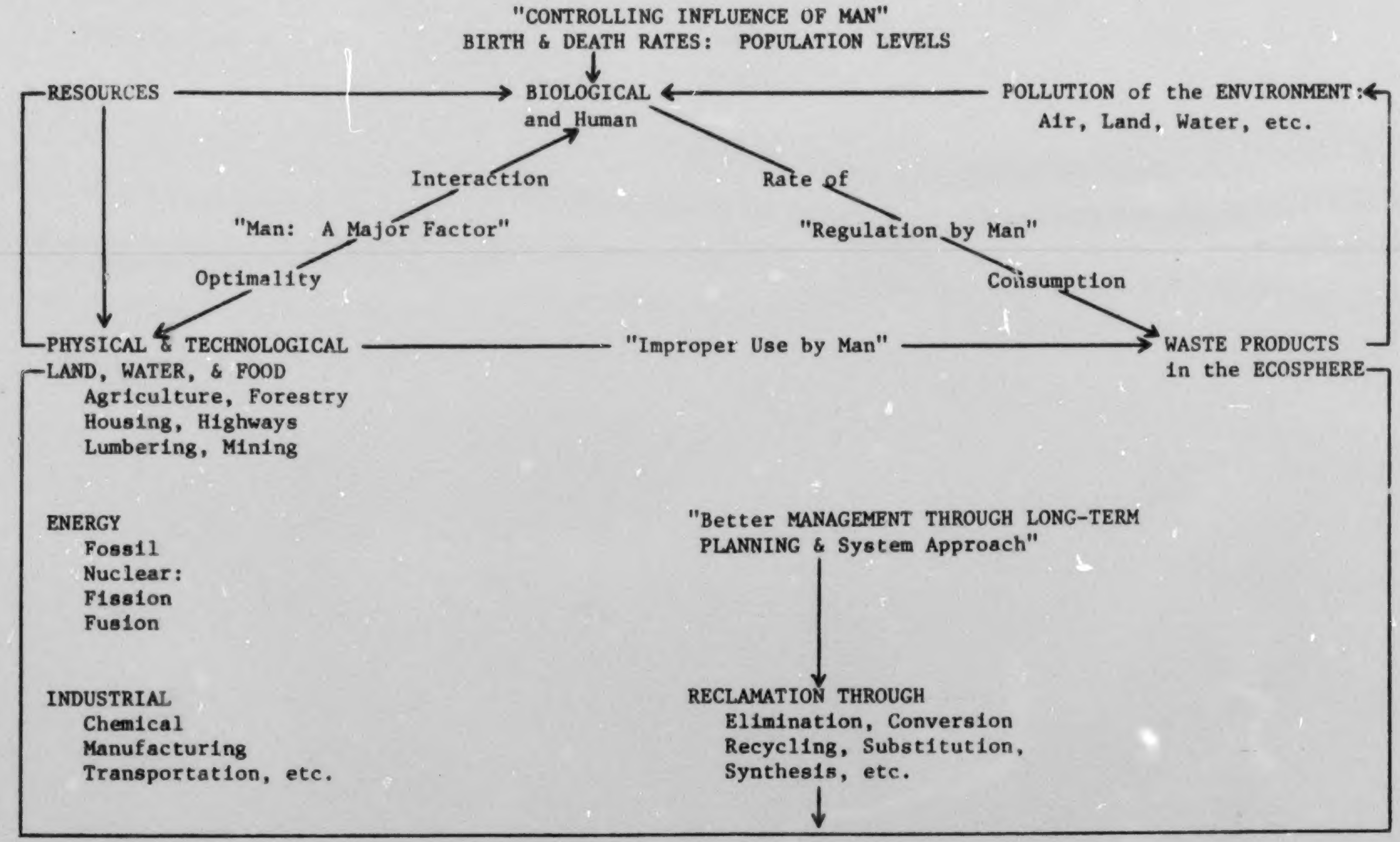

"CONTROLLING INFLUENCE OF MAN"
BIRTH & DEATH RATES: POPULATION LEVELS
RESOURCES
BIOLOGICAL and Human
POLLUTION of the ENVIRONMENT: Air, Land, Water, etc.
Interaction
"Man: A Major Factor"
Optimality
Rate of
"Regulation by Man"
Consumption
PHYSICAL & TECHNOLOGICAL
"Improper Use by Man"
WASTE PRODUCTS in the ECOSPHERE
LAND, WATER, & FOOD
Agriculture, Forestry
Housing, Highways
Lumbering, Mining
ENERGY
Fossil
Nuclear:
Fission
Fusion
INDUSTRIAL
Chemical
Manufacturing
Transportation, etc.
"Better MANAGEMENT THROUGH LONG-TERM PLANNING & System Approach"
RECLAMATION THROUGH
Elimination, Conversion
Recycling, Substitution,
Synthesis, etc.

Figure 14. Sehgal (1970). Factors in the environmental crisis and its solution.

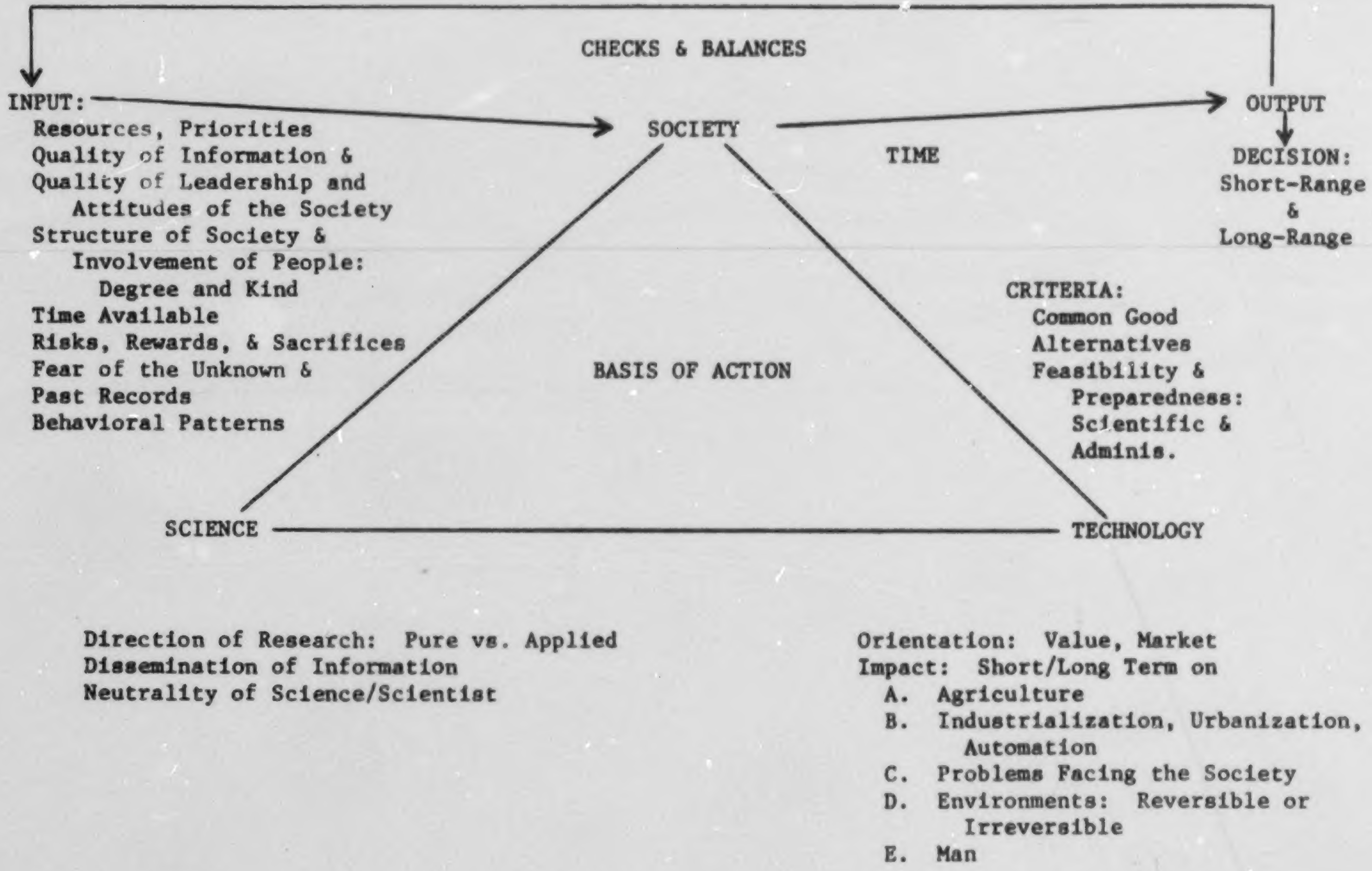

CHECKS & BALANCES
INPUT:
Resources, Priorities
Quality of Information &
Quality of Leadership and
Attitudes of the Society
Structure of Society &
Involvement of People:
Degree and Kind
Time Available
Risks, Rewards, & Sacrifices
Fear of the Unknown &
Past Records
Behavioral Patterns
SOCIETY
TIME
OUTPUT
DECISION:
Short-Range
&
Long-Range
BASIS OF ACTION
CRITERIA:
Common Good
Alternatives
Feasibility &
Preparedness:
Scientific &
Adminis.
SCIENCE
TECHNOLOGY
Direction of Research: Pure vs. Applied
Dissemination of Information
Neutrality of Science/Scientist
Orientation: Value, Market
Impact: Short/Long Term on
A. Agriculture
B. Industrialization, Urbanization, Automation
C. Problems Facing the Society
D. Environments: Reversible or Irreversible
E. Man

Figure 15. Sehgal (1970). Social resources for the restoration of the environment.

Ross (1970) (Figures 16, 17, and 18). Ross (1970) presents three paradigms (how personal characteristics affect the process, the individual decision-making process, and the information attitude process). In relation to those paradigms, he suggests lines of research.

1. Decision-making as related to environmental quality
    a. consensus decision-making
    b. media systems and decision-making
    c. controversy and decision-making
    d. alternatives and decision-making

2. Attitude change as a function of communication on environmental quality
    a. attitudes toward conservation
    b. comprehension
    c. stress and environmental communication
    d. individual response to complicated problems

3. other lines
    a. formal and informal communication
    b. communication mood

Brice (1972) (Figure 19). Brice describes a

model for developing environmental education programs. The model includes 23 identifiable steps organized into three implementation stages: (a) problem specification and planning, (b) research and development, and (c) unit evaluation. (1) identify instructional problem, (2) identify learning population, (3) specify content area, (4) analyze instructional context, (5) select trial groups, (6) select evaluative panel, (7) select field testing center, (8) design formative evaluation, (9) design conceptual framework, (10) specify unit objectives, (11) identify content dimensions, (12) select appropriate media, (13) design methods of instruction, (14) develop prototype unit, (15) analyze formative evaluation, (16) develop summative evaluation, (17) poll evaluative panel, (18) analyze evaluation forms, (19) try-out prototype unit, (20) analyze response forms, (21) analyze self-renewal data, (22) re-cycle, (23) modify procedural model.

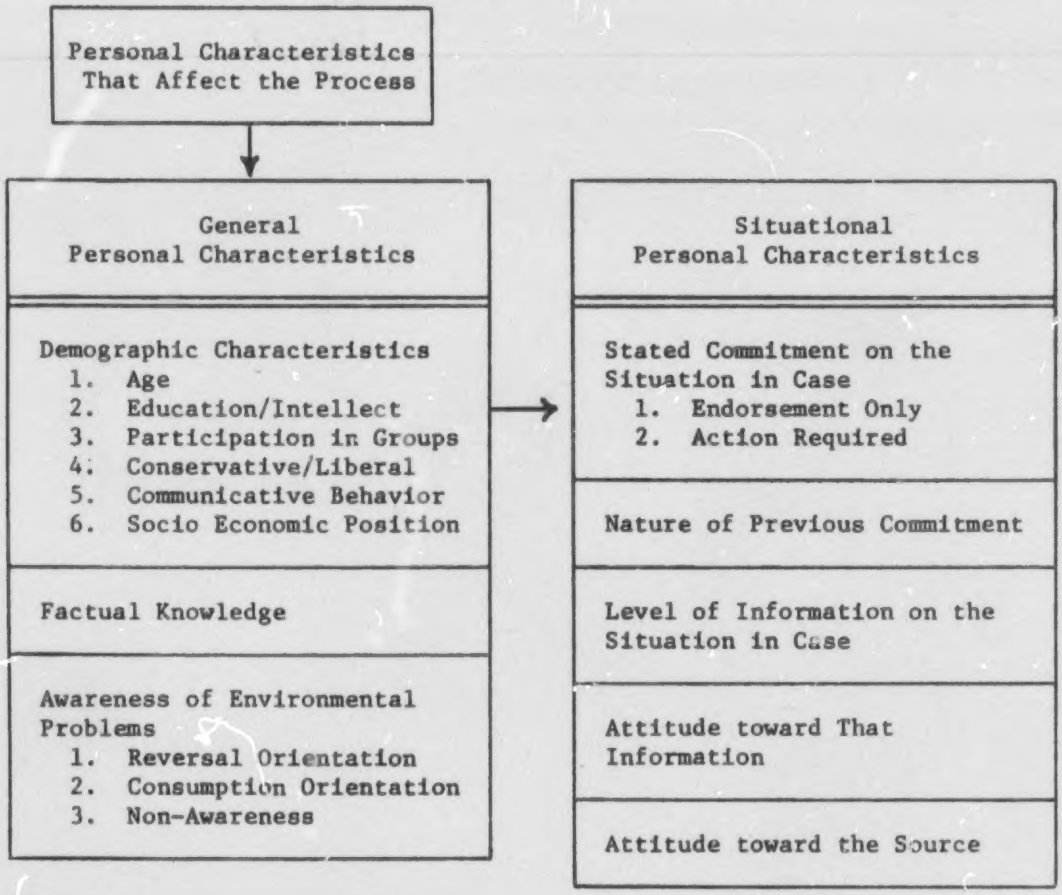

Personal Characteristics That Affect the Process
General Personal Characteristics
Demographic Characteristics
1. Age
2. Education/Intellect
3. Participation in Groups
4. Conservative/Liberal
5. Communicative Behavior
6. Socio Economic Position
Factual Knowledge
Awareness of Environmental Problems
1. Reversal Orientation
2. Consumption Orientation
3. Non-Awareness
Situational Personal Characteristics
Stated Commitment on the Situation in Case
1. Endorsement Only
2. Action Required
Nature of Previous Commitment
Level of Information on the Situation in Case
Attitude toward That Information
Attitude toward the Source

Figure 16. Ross (1970).

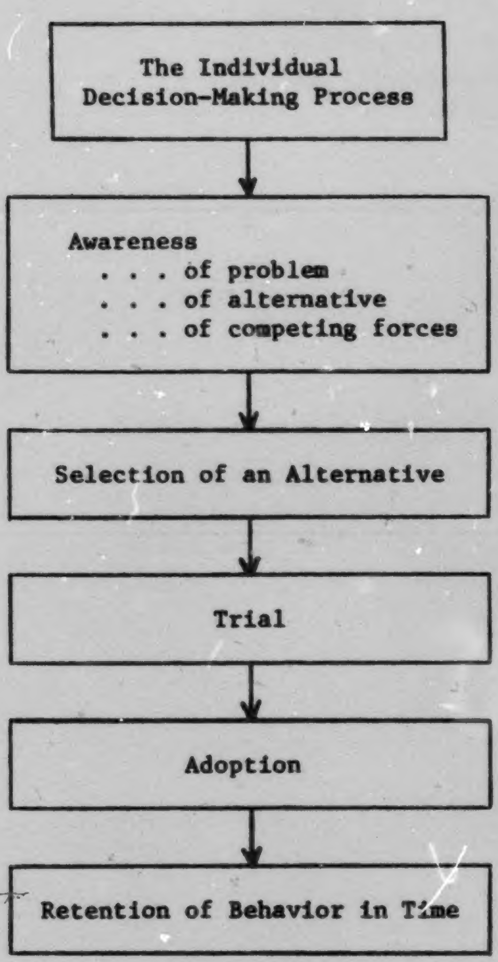

The Individual Decision-Making Process
Awareness
. . . of problem
. . . of alternative
. . . of competing forces
Selection of an Alternative
Trial
Adoption
Retention of Behavior in Time

Figure 17. Ross (1970).

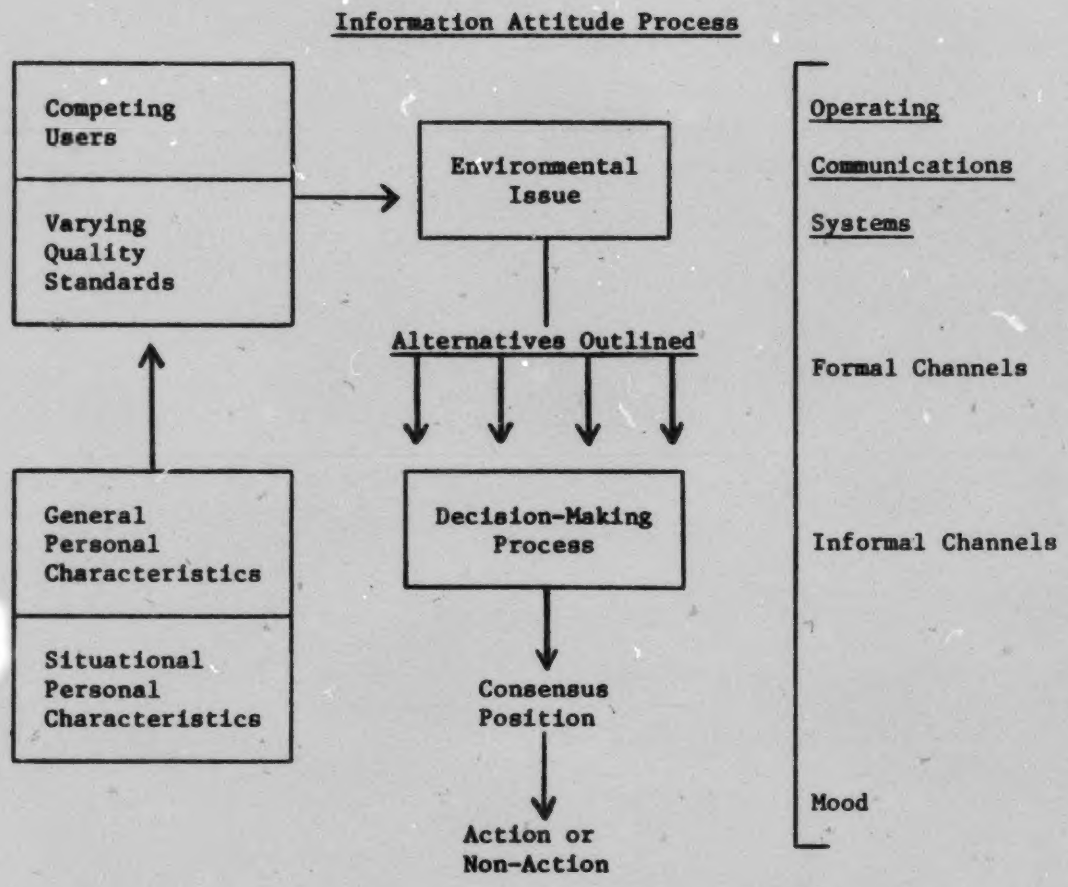

Information Attitude Process
Competing Users
Varying Quality Standards
Environmental Issue
Alternatives Outlined
Decision-Making Process
Consensus Position
Action or Non-Action
General Personal Characteristics
Situational Personal Characteristics
Operating
Communications
Systems
Formal Channels
Informal Channels
Mood

Figure 18. Ross (1970).

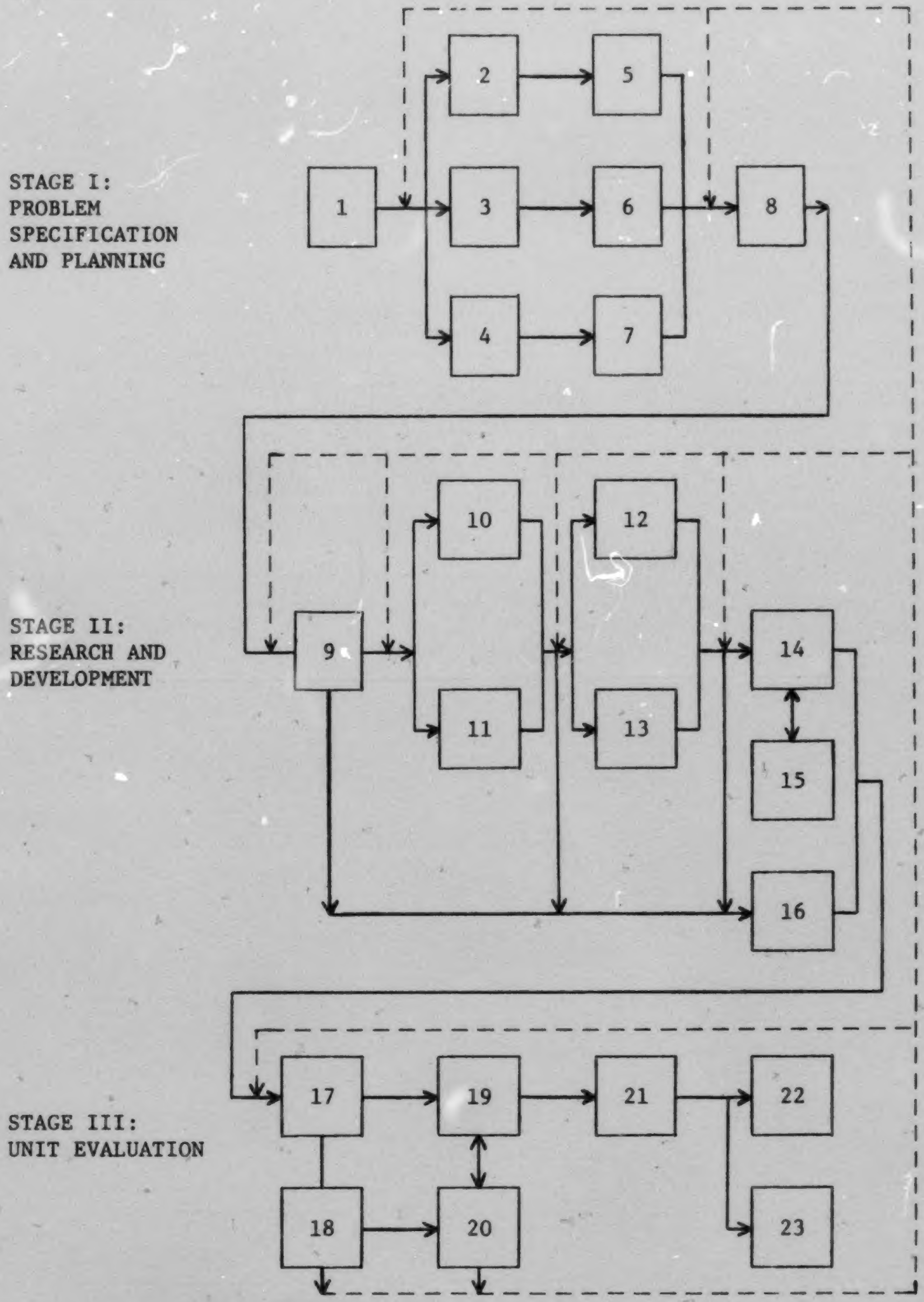

STAGE I:
PROBLEM
SPECIFICATION
AND PLANNING
1
2
3
4
5
6
7
8
STAGE II:
RESEARCH AND
DEVELOPMENT
9
10
11
12
13
14
15
16
STAGE III:
UNIT EVALUATION
17
18
19
20
21
22
23

Figure 19. Brice (1972).

Cummings (1974) (Figure 20).

The purpose of this paper is to suggest a methodological model for environmental education. . . . The rest of the paper is a discussion of the special features of decision-making as a methodological approach to environmental education.

The range of decisions or even the typical decision generally requires a variety of problem techniques and methods, and not necessarily including those of biology or even of science. I have grouped available techniques under three headings (Figure [20]) primarily for convenience of discussion. The problem solver must be able to select those which are appropriate to his situation; once selected, he must be skilled enough to apply them.

Cummings (1974) (Figure 21).

Science no longer attempts to teach its methods out of context and problem solving or inquiry should not be removed from the context of decision-making. To do so would be to ignore one of environmental education's most valuable contributions. In decision-making, problem solving is integrated with a valuing process (Figure [21]). Valuing is the link between thinking and action. It transcends pure reason by including the non-rational (as opposed to the ir-rational) with the rational. Thinking may help us to see the alternatives which are relevant, and valuing helps us in the process of choosing from among alternatives.

Zeitler (1974) (Figure 22).

The construction of the EEW [environmental-ecological web] is designed as a means of involving children in a method of problem solving which would serve them in the future. They have the actual experience of identifying and investigating events in their environments and defining problems which these events create or influence.

Figure [22] lists the sequence of activities for the organization of the Environmental-Ecological Web Study.

CHOOSING ALTERNATIVES THROUGH PROBLEM SOLVING

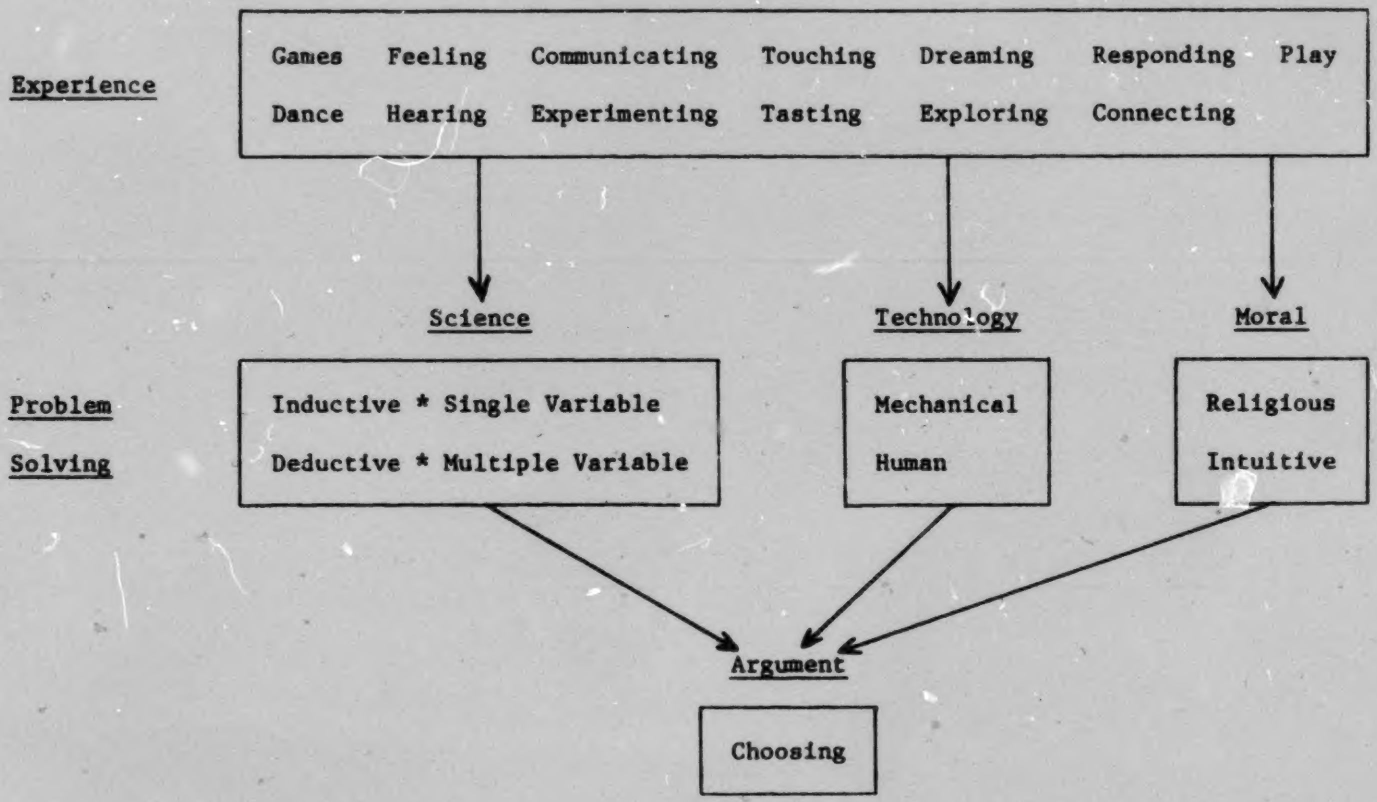

Experience
Games
Feeling
Communicating
Touching
Dreaming
Responding
Play
Dance
Hearing
Experimenting
Tasting
Exploring
Connecting
Science
Technology
Moral
Problem Solving
Inductive * Single Variable
Deductive * Multiple Variable
Mechanical
Human
Religious
Intuitive
Argument
Choosing

Figure 20. Cummings (1974).

A PROCESS MODEL OF DECISION-MAKING

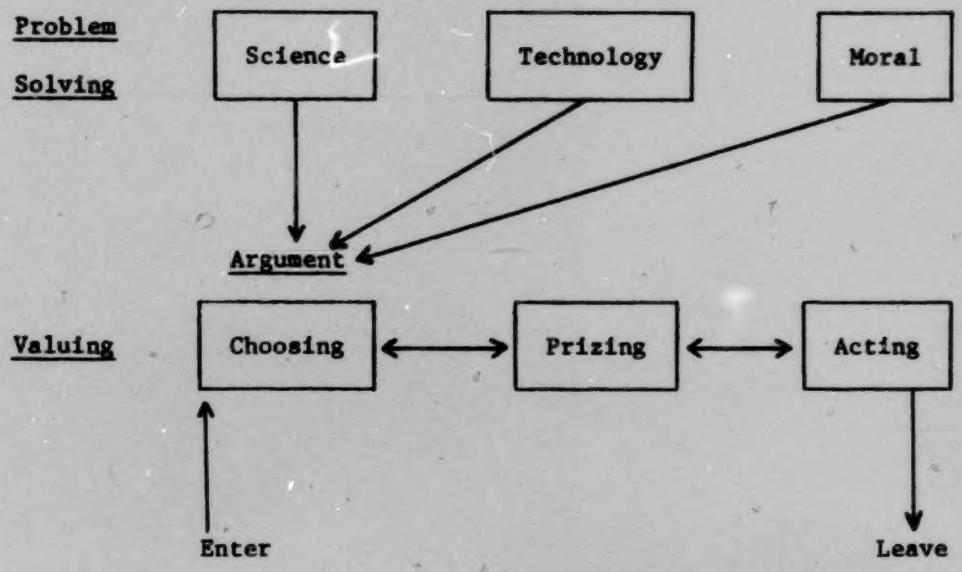

Problem
Solving
Science
Technology
Moral
Argument
Valuing
Choosing
Prizing
Acting
Enter
Leave

Figure 21. Cummings (1974).

SEQUENCE OF ACTIVITIES

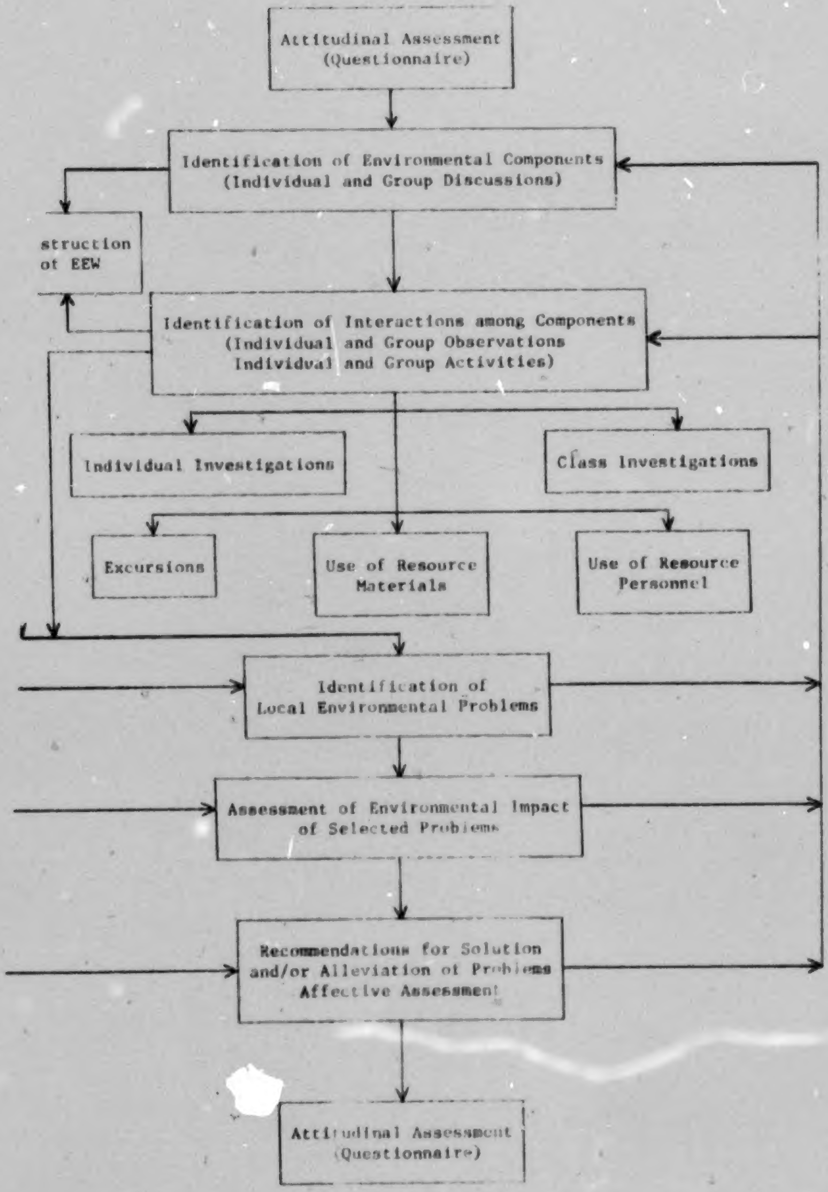
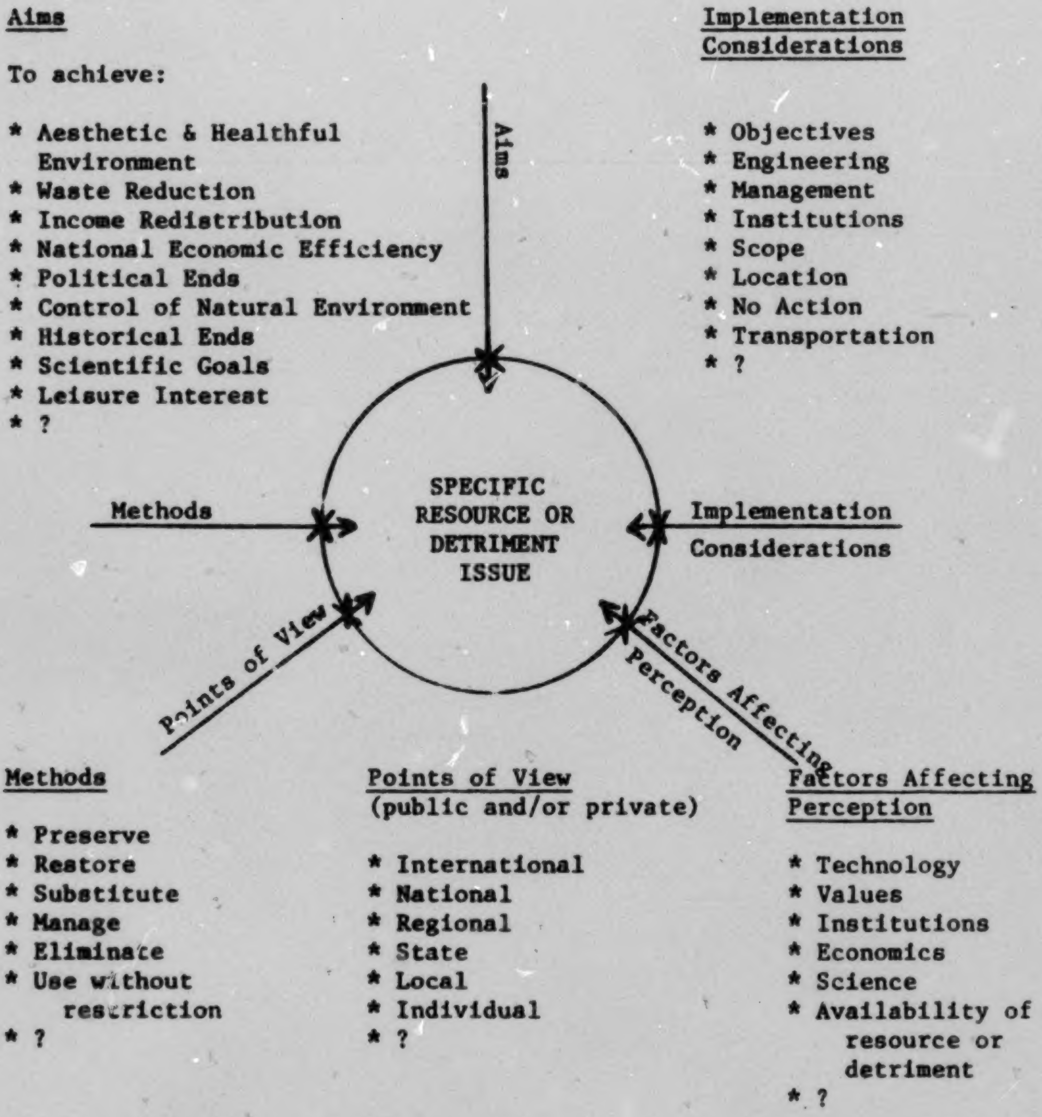

Attitudinal Assessment (Questionnaire)
Identification of Environmental Components (Individual and Group Discussions)
struction of EEW
Identification of Interactions among Components (Individual and Group Observations Individual and Group Activities)
Individual Investigations
Class Investigations
Excursions
Use of Resource Materials
Use of Resource Personnel
Identification of Local Environmental Problems
Assessment of Environmental Impact of Selected Problems
Recommendations for Solution and/or Alleviation of Problems Affective Assessment
Attitudinal Assessment (Questionnaire)

Figure 22. Zeitler (1974).

Knapp (1975) (Figure 23). Knapp provides a model of the elements of an environmental issue. Focused on the "specific resource or detriment issue" are aims, methods, points of view, factors affecting perception, and implementation considerations. He provides many examples.


Aims
Methods
SPECIFIC RESOURCE OR DETRIMENT ISSUE
Implementation Considerations
Points of View
Factors Affecting Perception

Aims

To achieve:

- * Aesthetic & Healthful Environment
- * Waste Reduction
- * Income Redistribution
- * National Economic Efficiency
- * Political Ends
- * Control of Natural Environment
- * Historical Ends
- * Scientific Goals
- * Leisure Interest
- * ?

Implementation Considerations

- * Objectives
- * Engineering
- * Management
- * Institutions
- * Scope
- * Location
- * No Action
- * Transportation
- * ?

Methods

- * Preserve
- * Restore
- * Substitute
- * Manage
- * Eliminate
- * Use without restriction
- * ?

Points of View (public and/or private)

- * International
- * National
- * Regional
- * State
- * Local
- * Individual
- * ?

Factors Affecting Perception

- * Technology
- * Values
- * Institutions
- * Economics
- * Science
- * Availability of resource or detriment
- * ?

Figure 23. Knapp (1975).

Watkins (1975) (Figure 24). Watkins provides a school/community model of environmental education. "Data taken from the community, generalized in the school, then applied to the community."

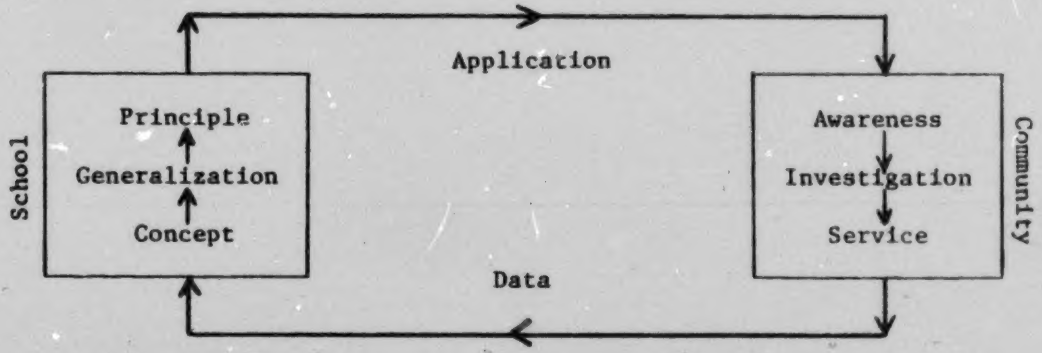

Application
School
Principle
Generalization
Concept
Awareness
Investigation
Service
Community
Data

Figure 24. Watkins (1975).

Baldwin, Barrett, Barthel, Fairburn, & Wilson (1975) (Figure 25).

> The current interest in environmental problems mandates that greater attention be paid to the process by which such problems are solved. [This] is particularly necessary in the environmental arena where the avoidance of unnecessary overlap of effort and the coordination of all relevant factors must be achieved by the various participating disciplines.
>
> Such a process is illustrated in Figure [25]. In viewing this process two points must be remembered. First, it is not completely deterministic in the sense that each step is executed solely in a sequential manner. . . . Second, the various participants provide greater or less input at various steps in the process.

ENVIRONMENTAL SCIENCES

THE PROBLEM SOLVING PROCESS

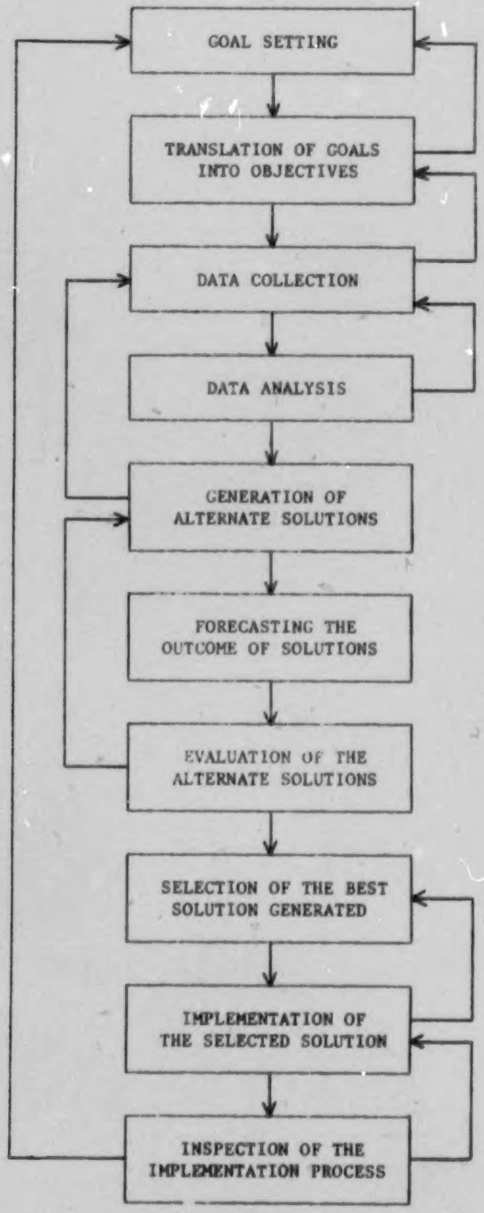

GOAL SETTING
TRANSLATION OF GOALS INTO OBJECTIVES
DATA COLLECTION
DATA ANALYSIS
GENERATION OF ALTERNATE SOLUTIONS
FORECASTING THE OUTCOME OF SOLUTIONS
EVALUATION OF THE ALTERNATE SOLUTIONS
SELECTION OF THE BEST SOLUTION GENERATED
IMPLEMENTATION OF THE SELECTED SOLUTION
INSPECTION OF THE IMPLEMENTATION PROCESS

Figure 25. Baldwin et al. (1975).

Matthews (1976) (Figure 26).

There are two major elements involved in analyzing environmental management processes: (1) the role of values or purely subjective judgments in decision-making, and (2) the role of scientific information or purely objective judgments. Because environmental management involves both people and the natural and physical environment, these two elements are present in every decision. The people supply the values and the "laws of nature" create the need for a scientific objective understanding of cause-effect relation in the physical world.

Figure 26 presents a very simplified idealized diagram of the decision-making steps in environmental management processes. The real processes are much more complicated and certainly do not follow such an orderly and logical set of steps. This framework is however useful for isolating major decision steps and determining the educational needs of decision-makers for that step.

MAJOR DECISION-MAKING STEPS IN ENVIRONMENTAL MANAGEMENT PROCESSES

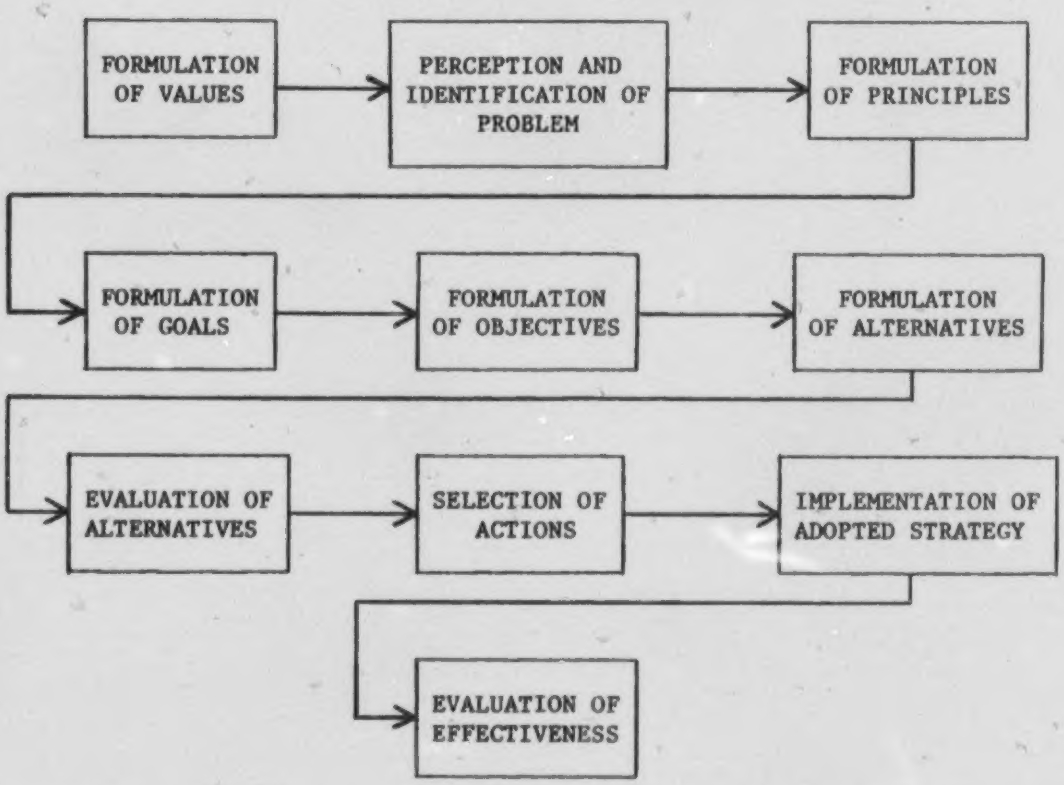

FORMULATION OF VALUES
PERCEPTION AND IDENTIFICATION OF PROBLEM
FORMULATION OF PRINCIPLES
FORMULATION OF GOALS
FORMULATION OF OBJECTIVES
FORMULATION OF ALTERNATIVES
EVALUATION OF ALTERNATIVES
SELECTION OF ACTIONS
IMPLEMENTATION OF ADOPTED STRATEGY
EVALUATION OF EFFECTIVENESS

Figure 26. Matthews (1976).

Hungerford & Peyton (1976) (Figure 27).

This paradigm has implications for educators desiring to develop instructional materials for environmental action training as well as for those citizens and groups attempting to isolate categories of action strategies. Further, this paradigm presents the very real constaints that should be considered as one attempts to make a decision about a specific mode of environmental action which is being considered. This paradigm is composed of three parts.

Part I: Categories and definitions of environmental action--
There appear to be six (6) categories of environmental action. These are: (1) persuasion; (2) consumerism; (3) political action; (4) legal action; (5) ecomanagement; and (6) interactions of the above. The writers operationally define each category.

Part II: Levels of decision-making for environmental action--
See figure 27 for the paradigm.

Part III: Action analysis criteria--
Given that the individual--or the group--understands the options available for action and the levels at which the action can be initiated, it follows that a particular action decision needs to be analyzed and evaluated before it is taken.

The writers, therefore, propose a set of twelve (12) questions which should be answered before a particular action is taken. . . .

1. Is there sufficient evidence to warrant action of this issue?
2. Are there alternative actions available for use? What are they?
3. Is the action chosen the most effective one available?
4. Are there legal consequences of this action? If so, what are they?
5. Will there be social consequences of this action? If so, what are they?
6. Will there be economic consequences of this action? If so, what are they?
7. Are my (our) personal values consistent with this action?
8. Do I (we) understand the procedures necessary to take this action?
9. Do I (we) have the skills needed to take this action?
10. Do I (we) have the courage to take this action?
11. Do I (we) have the time needed to complete this action?
12. Do I (we) have all of the other resources needed (other than the above) available to make this action effective?

Levels of Environmental Action and Decision-Making

Individual and Organizational

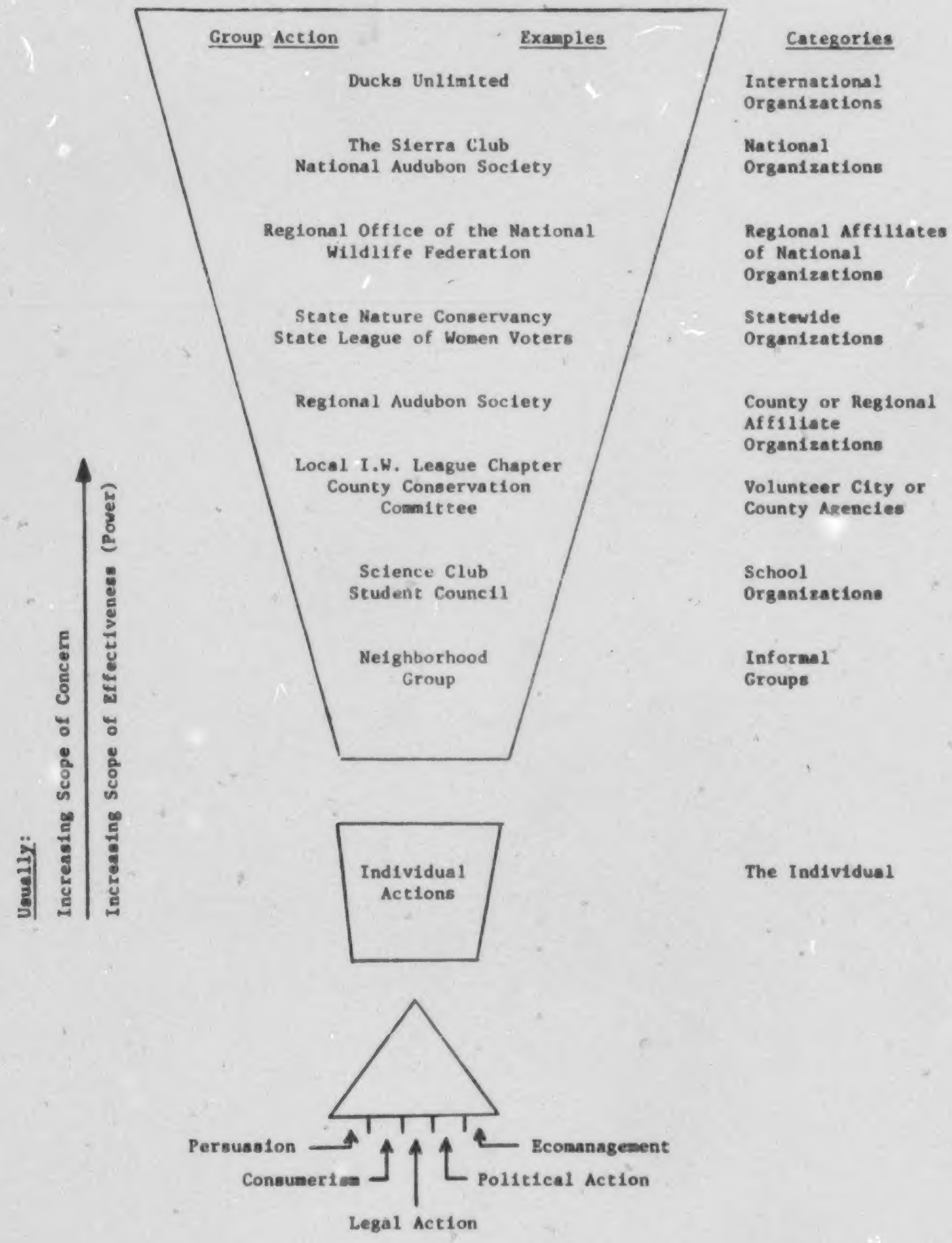

Group Action
Examples
Categories
Ducks Unlimited
International Organizations
The Sierra Club
National Audubon Society
National Organizations
Regional Office of the National Wildlife Federation
Regional Affiliates of National Organizations
State Nature Conservancy
State League of Women Voters
Statewide Organizations
Regional Audubon Society
County or Regional Affiliate Organizations
Local I.W. League Chapter
County Conservation Committee
Volunteer City or County Agencies
Science Club
Student Council
School Organizations
Neighborhood Group
Informal Groups
Individual Actions
The Individual
Usually:
Increasing Scope of Concern
Increasing Scope of Effectiveness (Power)
Persuasion
Consumerism
Legal Action
Political Action
Ecomanagement

Figure 27. Hungerford & Peyton (1976).

Subject-Matter Relationship Paradigms

Paradigms in this sub-section show relationships (1) between specific subjects and the man-nature interaction, and/or (2) between general areas of study and specific subjects.

Joranson (1970) (Figure 28).

> First, we need to look at all the different kinds of relationships between man and nature. They are of many types. This is suggested by the center portion of Figure [28].
>
> [It is necessary to make] full use of appropriate fields in the humanities, in addition to those fields of knowledge upon which we now rely. It will mean--as the arching portion of Figure [28] illustrates--adding to our usual approaches through natural science, mathematics, economics, and (laterally) sociology, some purposeful adventuring in philosophy, religion, literature, and art.

Loret (1974) (Figure 29).

> We are at the point where programs in environmental education desperately need to be included or reorganized in school curricula. Such programs must be broadly based in the development of an environmental literacy. . . . Following is a theoretical framework that may be utilized . . . in the development of an environmental education curriculum. . . .

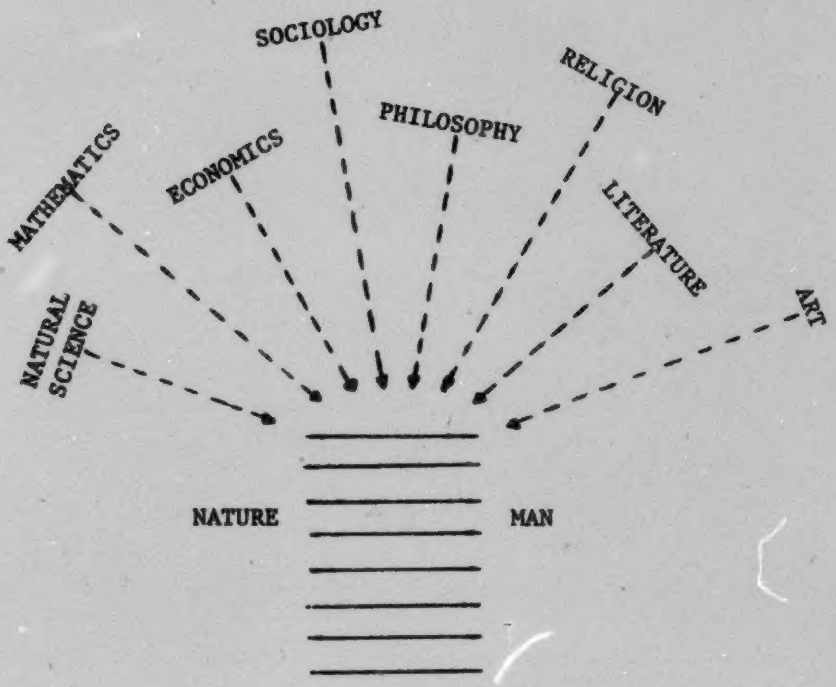

SOCIOLOGY
RELIGION
PHILOSOPHY
MATHEMATICS
ECONOMICS
LITERATURE
NATURAL SCIENCE
ART
NATURE
MAN

Figure 28. Joranson (1970).

A THEORETICAL MODEL FOR ENVIRONMENTAL EDUCATION

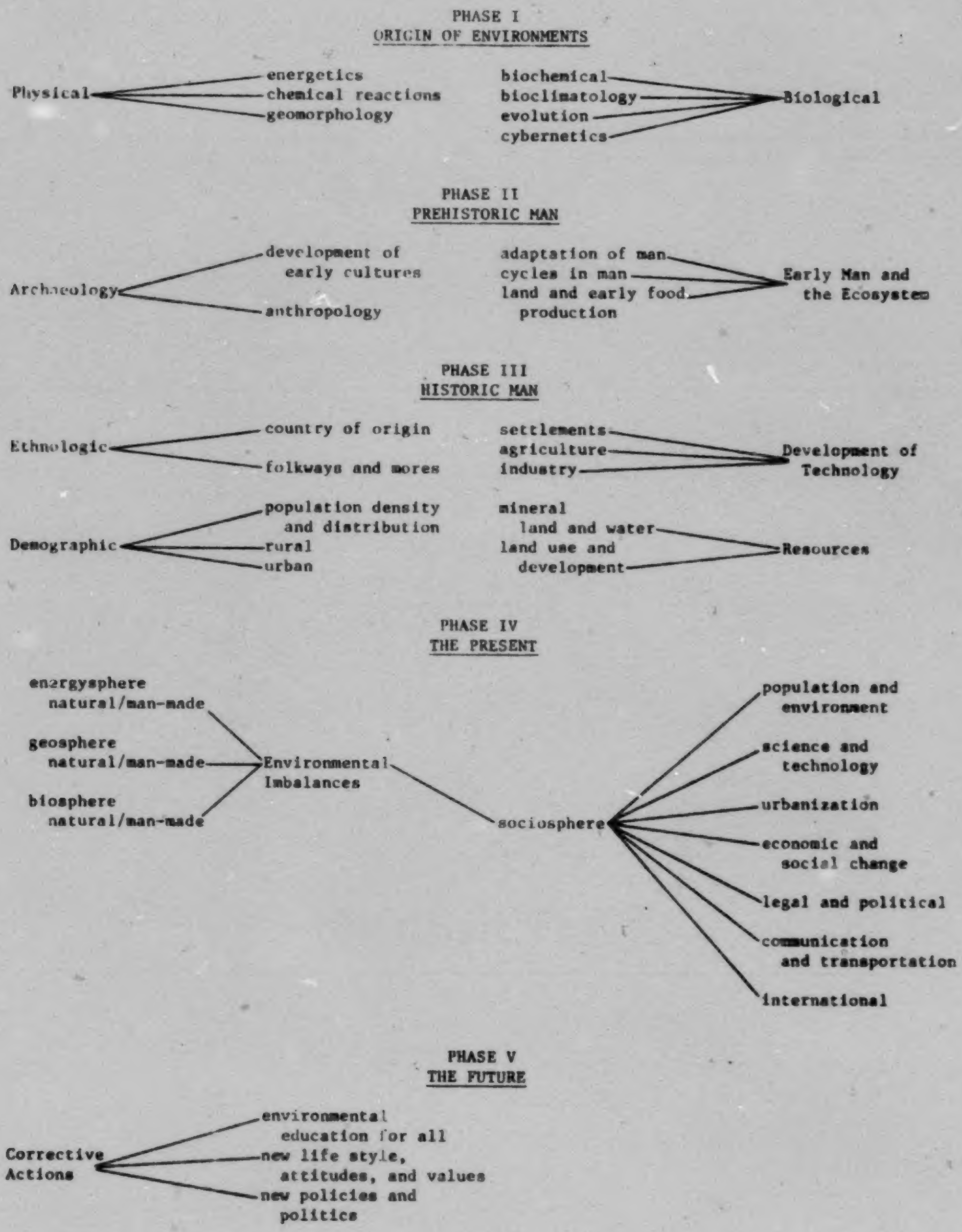

PHASE I
ORIGIN OF ENVIRONMENTS
Physical
energetics
chemical reactions
geomorphology
biochemical
bioclimatology
evolution
cybernetics
Biological
PHASE II
PREHISTORIC MAN
Archaeology
development of early cultures
anthropology
adaptation of man
cycles in man
land and early food production
Early Man and the Ecosystem
PHASE III
HISTORIC MAN
Ethnologic
country of origin
folkways and mores
settlements
agriculture
industry
Development of Technology
Demographic
population density and distribution
rural
urban
mineral
land and water
land use and development
Resources
PHASE IV
THE PRESENT
energysphere natural/man-made
geosphere natural/man-made
biosphere natural/man-made
Environmental Imbalances
sociosphere
population and environment
science and technology
urbanization
economic and social change
legal and political
communication and transportation
international
PHASE V
THE FUTURE
Corrective Actions
environmental education for all
new life style, attitudes, and values
new policies and politics

Figure 29. Loret (1974).

Tanner (1974) (Figure 30).

The reasons that some teachers and other educators scurry off in all directions under the EE banner are many and varied. At least a few individuals are confused by the almost universally accepted call for "multidisciplinary" EE. Some interpret this to mean that because EE can be a part of every subject area, it follows that the study of everything can properly be labeled as EE. The simple diagram figure 30 will dispel this fallacy.

The top row of the diagram is a sample of human concerns with which the school curriculum might deal. The bottom row is a sample of the subject areas in the school. Any of the problems at the top may be studied in a multidisciplinary fashion--that is, each problem may have a portion of each subject focused upon it.

Some have argued that it is not proper to focus EE in the manner suggested in the diagram because the problems are all connected. This is quite true, and the study of the other problem areas may be a part of EE, if the connections are made. . . . Another way of saying all this is to maintain that EE deals primarily with man-earth relationships. It deals with man-man relationships only as they affect, or are affected by, man-earth relationships.

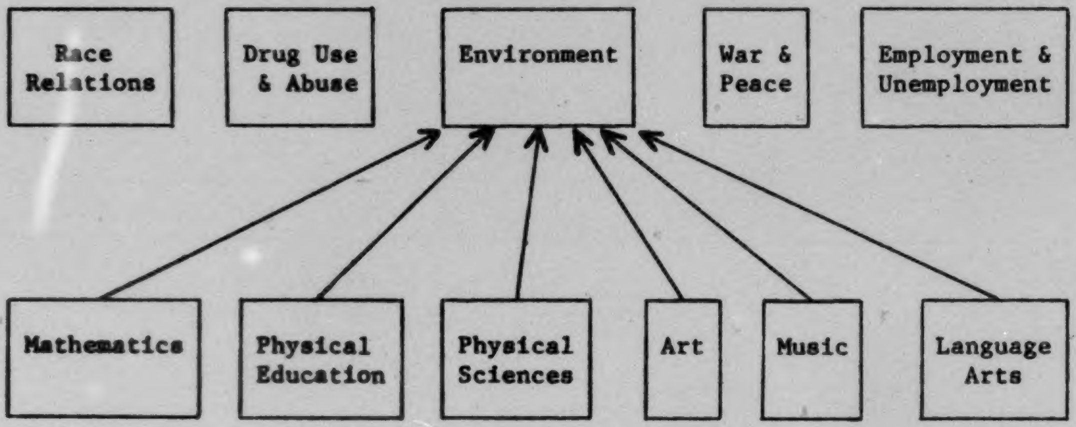

Race Relations
Drug Use & Abuse
Environment
War & Peace
Employment & Unemployment
Mathematics
Physical Education
Physical Sciences
Art
Music
Language Arts

Figure 30. Tanner (1974b).

Nash (1974) (Figure 31).

As practiced at the University of California, Santa Barbara, Environmental Studies is a multidisciplinary, problem-oriented major designed to give students a knowledge of the characteristics of the environment and the working approaches to the solution of environmental problems. Diagramatically, our philosophy of environmental studies might be expressed as shown in Figure [31].

Tired as it is after three mediocre decades "general education," or its equivalent by another name, seems to us to be worth salvaging on the undergraduate level. What is needed for this operation is a framework for integrating a broad range of letters and science. . . . Couldn't environmental studies become the new general education? We believe that there is no better concept than that of man-environment relations for synthesizing the sciences, social sciences, and humanities.

SANTA BARBARA ENVIRONMENTAL STUDIES

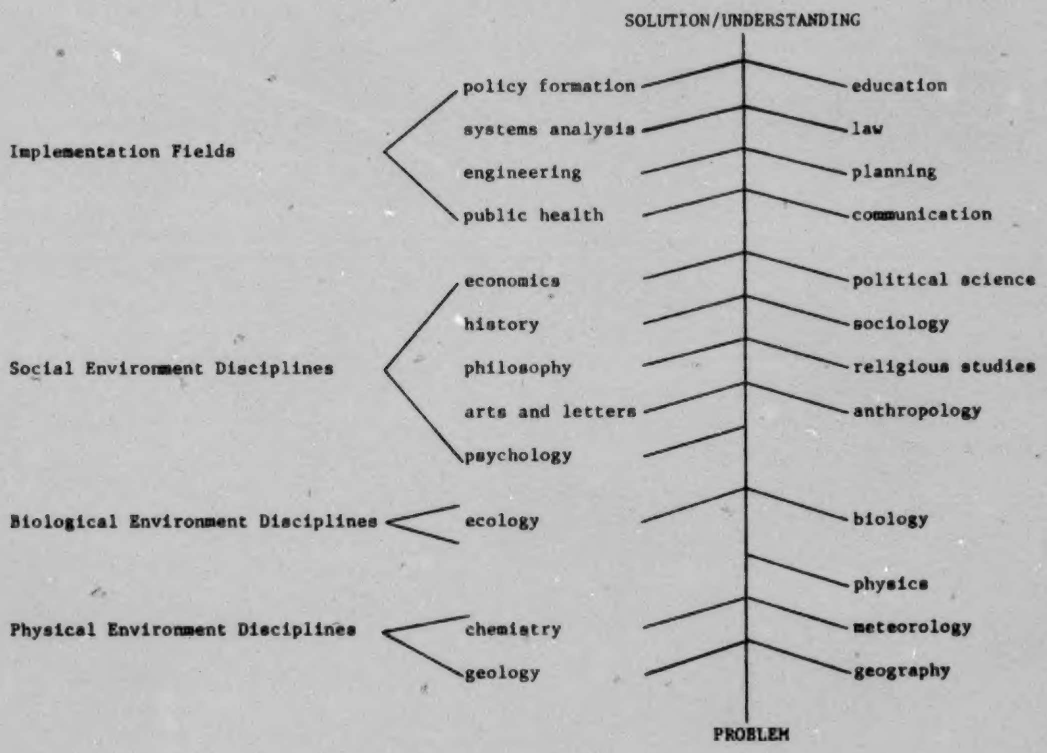

SOLUTION/UNDERSTANDING
Implementation Fields
policy formation
systems analysis
engineering
public health
education
law
planning
communication
Social Environment Disciplines
economics
history
philosophy
arts and letters
psychology
political science
sociology
religious studies
anthropology
Biological Environment Disciplines
ecology
biology
Physical Environment Disciplines
chemistry
geology
physics
meteorology
geography
PROBLEM

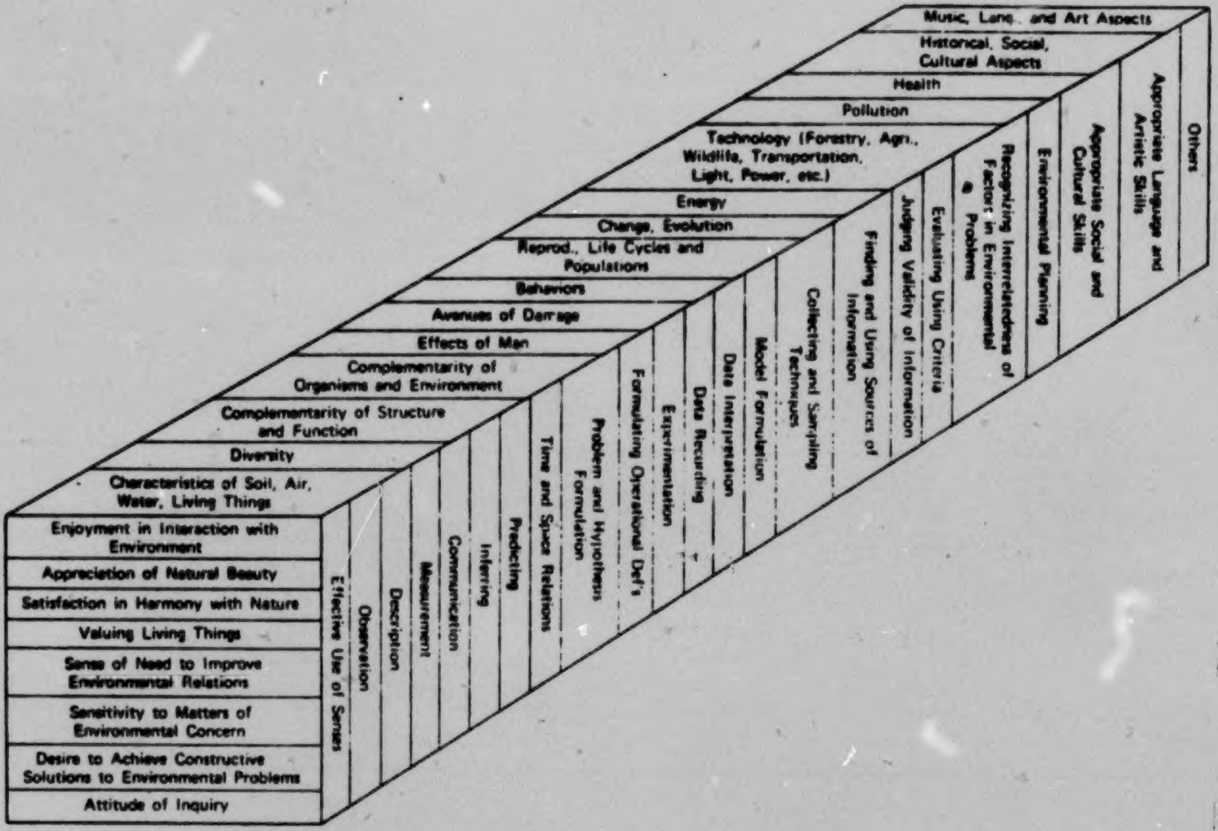
Figure 31. Nash (1974).

Curriculum Paradigms

The term curriculum is used in a broad sense in the title of this sub-section. The paradigms included will each have the characteristic of depicting the interaction of elements related to environmental education in a two-dimensional or a three-dimensional matrix. These paradigms differ from those in the "subject-matter relationship" sub-section in that if subject matter designations are utilized in the paradigm, they are interacting with other components which are not subject-matter.

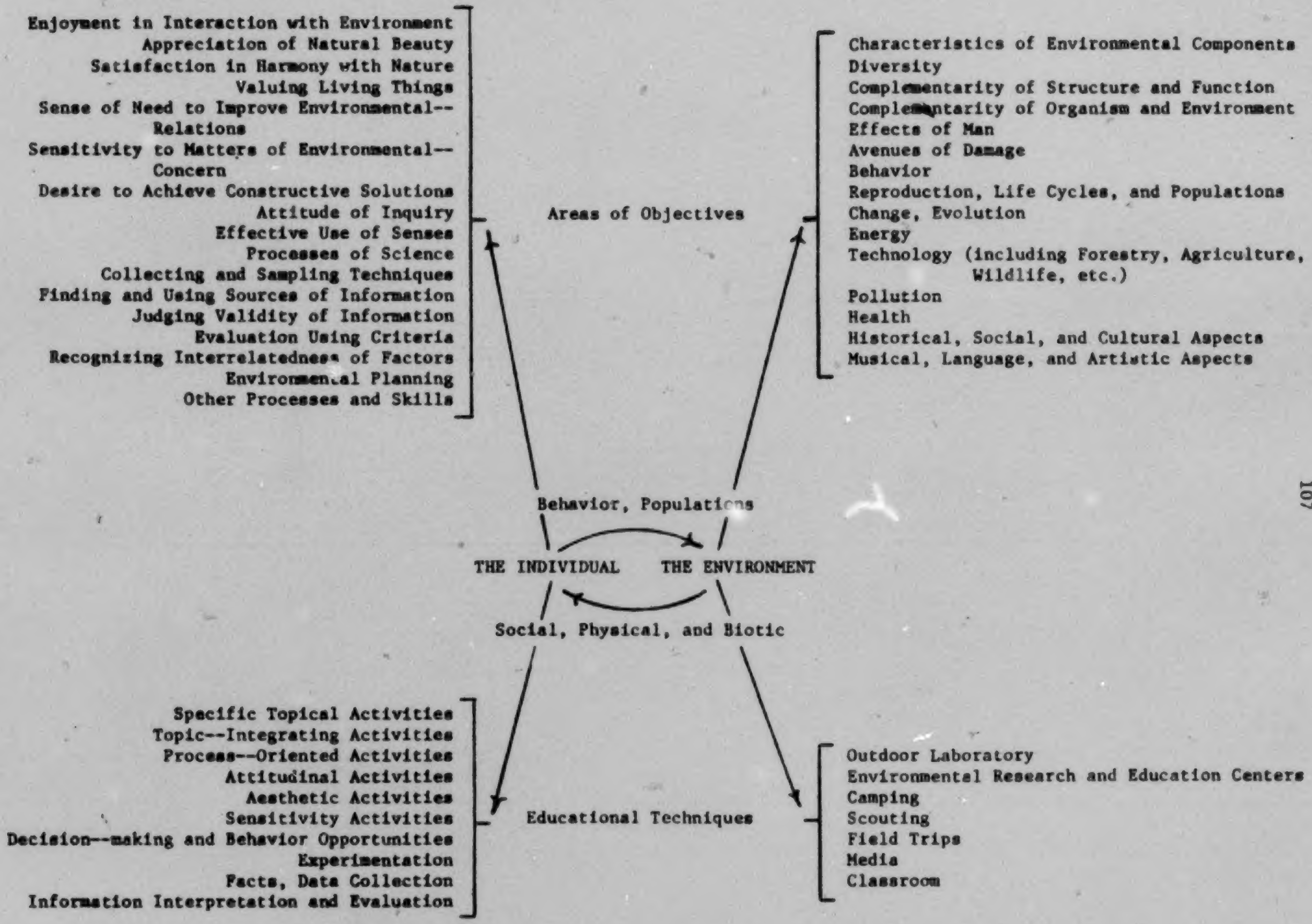
> Balzer (1970) (Figure 32). In figure [32] are shown some of the
>
> major areas of interest to the biology educator, in which behavioral objectives might be specified in environmental education. The activities and experiences of environmental education would constitute the volume of the grid and a given experience (visualized as being within the box) would normally have components in each of the three dimensions. In some cases, attitudes might be more heavily emphasized and in other cases one of the other dimensions might receive more attention.

> Balzer (1970) (Figure 33).
>
> Figure [33] is an attempt to illustrate some of the major relationships of environmental education. At the center of the scheme are the individual and the environment, which interact as indicated. Associated with the individual are numerous areas of objectives within which behavioral examples can be specified. Also associated with the individual are the various types of activities in which he will be participating thus gaining experience in the performance of the types of behaviors being specified. . . . The experiences themselves occur in an integrated manner.


Music, Lang., and Art Aspects
Historical, Social, Cultural Aspects
Health
Pollution
Technology (Forestry, Agri., Wildlife, Transportation, Light, Power, etc.)
Energy
Change, Evolution
Reprod., Life Cycles and Populations
Behaviors
Avenues of Damage
Effects of Man
Complementarity of Organisms and Environment
Complementarity of Structure and Function
Diversity
Characteristics of Soil, Air, Water, Living Things
Enjoyment in Interaction with Environment
Appreciation of Natural Beauty
Satisfaction in Harmony with Nature
Valuing Living Things
Sense of Need to Improve Environmental Relations
Sensitivity to Matters of Environmental Concern
Desire to Achieve Constructive Solutions to Environmental Problems
Attitude of Inquiry
Effective Use of Senses
Observation
Description
Measurement
Communication
Inferring
Predicting
Time and Space Relations
Problem and Hypothesis Formulation
Formulating Operational Def's
Experimentation
Data Recording
Data Interpretation
Model Formulation
Collecting and Sampling Techniques
Finding and Using Sources of Information
Judging Validity of Information
Evaluating Using Criteria
Recognizing Interrelatedness of Factors in Environmental Problems
Environmental Planning
Appropriate Social and Cultural Skills
Appropriate Language and Artistic Skills
Others

Grid suggesting some major areas of objectives in environmental education.

Figure 32. Balzer (1970).


Enjoyment in Interaction with Environment
Appreciation of Natural Beauty
Satisfaction in Harmony with Nature
Valuing Living Things
Sense of Need to Improve Environmental--Relations
Sensitivity to Matters of Environmental--Concern
Desire to Achieve Constructive Solutions
Attitude of Inquiry
Effective Use of Senses
Processes of Science
Collecting and Sampling Techniques
Finding and Using Sources of Information
Judging Validity of Information
Evaluation Using Criteria
Recognizing Interrelatedness of Factors
Environmental Planning
Other Processes and Skills
Areas of Objectives
Characteristics of Environmental Components
Diversity
Complementarity of Structure and Function
Complementarity of Organism and Environment
Effects of Man
Avenues of Damage
Behavior
Reproduction, Life Cycles, and Populations
Change, Evolution
Energy
Technology (including Forestry, Agriculture, Wildlife, etc.)
Pollution
Health
Historical, Social, and Cultural Aspects
Musical, Language, and Artistic Aspects
Behavior, Populations
THE INDIVIDUAL
THE ENVIRONMENT
Social, Physical, and Biotic
Specific Topical Activities
Topic--Integrating Activities
Process--Oriented Activities
Attitudinal Activities
Aesthetic Activities
Sensitivity Activities
Decision--making and Behavior Opportunities
Experimentation
Facts, Data Collection
Information Interpretation and Evaluation
Educational Techniques
Outdoor Laboratory
Environmental Research and Education Centers
Camping
Scouting
Field Trips
Media
Classroom

Preliminary scheme of major relationships involved in environmental education.

Figure 33. Balzer (1970).

Ralston & Martin (1970) (Figure 34).

> Rapidly shrinking distances between inhabitants of space ship "Earth" preclude our planning for long-run environmental improvements as one nation. . . .
>
> This model presents a matrix with the ordinate reflecting the classical organization of study of our natural elements and ecology. . . . On the abscissa is a general breakout of people --cultural levels, age of people (the life cycle), and the three significant ways of reaching people of all ages and stages in their respective cultures.

Wang (1970) (Figure 35, 36 & 37).

> As shown in Table 1 [figure 35], the problem areas, both natural and man-made, are classified in accordance with the four major types of human environment: physical (geosphere and energy), biological (biosphere and energy), sociological (sociosphere and energy), and energy (energy sphere and the other three types of environment). Imbalances of nature and/or urban society are the sources of environmental problems.
>
> The classification of the human environments according to both natural and man-made processes related to these problem areas is illustrated in Table 2 [figure 36].
>
> This educational system may be conveniently described by the 3-dimensional matrix for higher education which is illustrated in Figure [37]. The input (or subject matter) enters the matrix of one side of the educational system cube element, and processing (or decision-making) enters on the other side of the cube. The output, which may be measured through individual reports, subjective evaluations, and objective surveys.
>
> Time is the fourth dimension of the model.

Wang suggests a six step "revolutionary approach" to implement the model.

GENERALIZED MODEL OF THE OVERALL CONCEPT OF NATURAL RESOURCES OF THE BIOSPHERE

		ILLUSTRATION OF MODEL FOR ADAPTATION TO A COUNTRY'S SITUATION								ILLUSTRATION OF POSSIBLE MODEL FOR U.S.A.							
		TROPICAL*				TEMPERATE*				MEGALOPOLIS				RURAL			
	Comprehension Level	Effective in Training and Influencing People			Specialized Training for Program Aides**	Effective in Train-in and Influencing People			Specialized Training for Program Aides**	Effective Methods			Specialized Training for Program Aides**	Effective Methods			Specialized Training for Program Aides**
		Formal	Informal	General		Formal	Informal	General		Formal	Informal	General		Formal	Informal	General	
A Simple relationships and needs of plants and animals: Land, Air, Water	Preschool		X	X	X		X	X	X			X	X			X	X
B Elementary Specifics pertaining to interdependency	Primary and Intermediate	X		X	X	X	X	X	X	X		X	X	X	X	X	X
C Natural Resource Appreciation	Junior High School	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X
D Conservation and wise use needs and practices	High School	X		X	X	X		X	X	X	X	X	X	X	X	X	X
E Specifics and Planning Conservation and wise use needs and practices	University	X		X		X		X		X		X		X		X	
	Other		X	X			X	X				X			X	X	
F Specifics and Planning Conservation and wise use needs and practices	Graduate	X		X		X		X		X		X		X		X	
	Other			X				X			X	X			X	X	
G More Specifics Broader Planning Conservation	Post PhD	X		X		X		X		X		X		X		X	
	Other		X	X			X	X			X	X			X	X	

* Substitute here the local conditions or hurdles (literate-nonliterate, ethnic, cultural, religious, etc.) and "X" the blocks offering the best opportunities for success under those conditions.

** "Program Aides" refers to sub-professionals, local leaders, and others who could, through special training, assist professional personnel by working in villages, communities, etc., with local groups, schools, and clubs.

Figure 34. Ralston & Martin (1970).

TABLE 1
CLASSIFICATION OF PROBLEM AREAS ACCORDING TO ENVIRONMENTS

Environment	Environment-Component Samples	Natural Hazards	Man-Made Hazards
ENERGYSPHERE	Solar Energy, Geotherms Hydraulic Power Nuclear Power Fossil Energy	Radioactive Radiation, Noise Pollution (Thunder), Lightning Glare	Sonic Boom, Industrial Radioactive Emission, Thermal Pollution, Household Electronic Equipment Radiation
GEOSPHERE	Atmosphere	Background Pollution, Hurricane, Tornado, Dust Devil, and other Severe Storms, Wind Erosion, Sea Spray	Air Pollution
	Hydrosphere	Tsunami, Blizzards, Flood, Drought, Water Erosion	Water Pollution (Oil Pollution)
	Lithosphere (Pedosphere)	Earthquake, Volcanic Eruption, Slide, Soil Compaction, Soil Erosion, Frost Mound	Land Pollution (Scenic Pollution)
BIOSPHERE	Plants Animals Bacteria Viruses Fungi	Thermal Damage (Freezing and Excess Heating), Mechanical Damage, Biological Decay, Pestilence, Forest and Brush Fire, Disease, Disability	Chemical and Biological Warfare (CBW), Overpopulation, Phytotoxication, Disease Disability, Biocides (Pesticide, Fertilizer Spray), Famine, Nutritional Deficiency
SOCIOSPHERE	Group Behavior Pattern (Family and Individual) Socioeconomical Behavior Legal Restrictions Urban Environment Political Boundaries Rural Environment	Physical Limitations (Water, Arable Land, and Natural Resource Deficiencies)	Civil and International Warfare (Riots, Campus Unrest, Border Strife, World War), Drug and Alcohol Abuse, Mental Health Inflation, Recession, Depression Civil Disobedience, Social Disorders (Racial and Religious Prejudice), Violence Traffic Congestion, Accidents, Urban Sprawl, Indoor Pollution, Waste Disposal (Solid and Fluid)

Figure 35. Wang (1970).

TABLE 2
EXAMPLES OF ENVIRONMENTAL IMBALANCES

Environment	Natural Hazards	Man-Made Hazards
ENERGYSPHERE:	-Excess electromagnetic waves (Thunder, lightning, glare, magnetic disturbance) -Crustal forces imbalance (Earthquake) -Fluid pressure imbalance (Volcanic eruption)	-Shock (accoustic) waves (Noise pollution) -Excess industrial heating on water (Thermal pollution) -Radioactive pollution
GEOSPHERE:	-Atmospheric pressure imbalance (Severe storm) -Seismic seawaves (Tsunami) -Precipitation exceeds evapotranspiration, runoff and percolation to the extreme (Flood) -Evaporation exceeds precipitation to the extreme (Drought)	-Excess airborne chemicals (Air pollution) -Excess chemical and biological materials (Water pollution) -Excess oil in water (Oil pollution) -Excess fertilizer and waste deposits (Land pollution) -Irrigation salt deposition (Farm land pollution)
BIOSPHERE:	-Heat deficiency (Freezing damage to biosphere) -Excess heat (Foehn) -Lightning ignition (Forest and brush fire) -Pestilence (Vegetation damage and destruction and epidemics)	-High birth rate, low mortality rate, and insufficient occupant space (Famine and urban sprawl) -Imbalance of nature (Extinction of species) -Excess biocides (Health hazard) -Drug and vaccine accidents
SOCIOSPHERE:	-Physical limitations of earth (Shortage of land, water, and other resources)	-Overpopulation, racial strife, herd behavior (Warfare) -Excess vehicles (Congestion, accidents, and air pollution) -Urbanization (Alienation and social disorders) -Poverty (Unemployment, hunger, and social disorders)

Figure 36. Wang (1970).

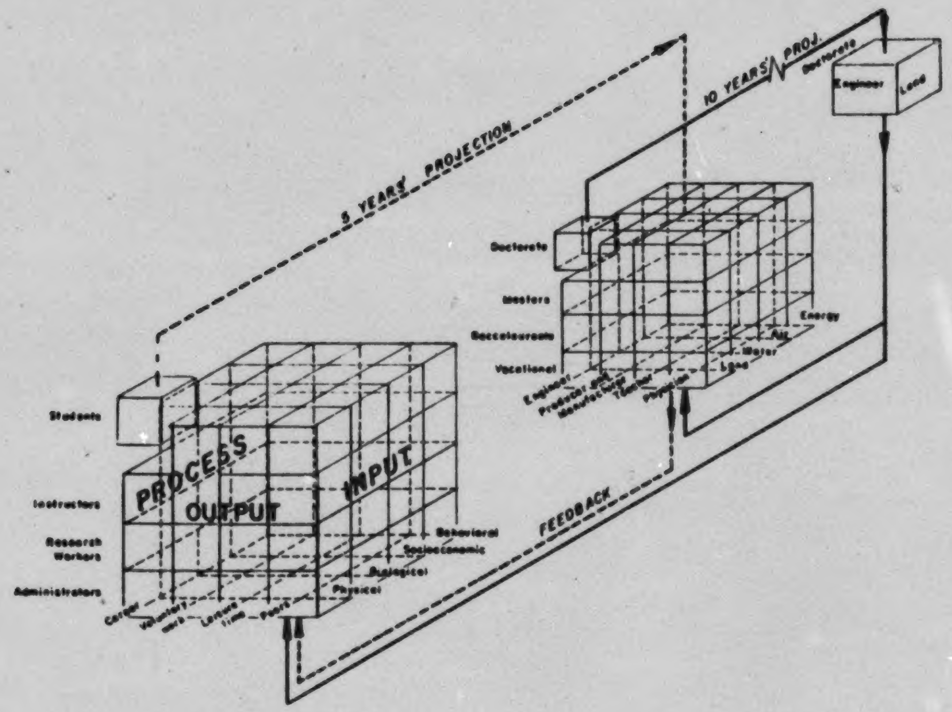

5 YEARS' PROJECTION
10 YEARS' PROJ.
Doctorate
Engineer
Land
Doctorate
Masters
Baccalaureate
Vocational
Energy
Air
Water
Land
Engineer
Production and Manufacture
Teacher
Physician
Students
PROCESS
OUTPUT
INPUT
Instructors
Research Workers
Administrators
Career
Voluntary work
Leisure time
Peers
Behavioral
Socioeconomic
Biological
Physical
FEEDBACK

Figure 37. Wang (1970).

Naylon (1971) (Figure 38).

Early planning contemplates the initial development of twelve activities, the skill levels of which will be commensurate with the abilities of students in grades seven through post high school. No specific grade level placement for the activities will be designated. At this time, it is felt that each instructor should consider the relative backgrounds of his students and make the ultimate placement determination. It is anticipated that lessons may be used as single, discreet learning activities or as sequential units of study (Figure [38]).

THIS SCHEMATIC GENERALLY DEPICTS THE CONTEMPLATED DISTRIBUTION OF ACTIVITIES ACCORDING TO SKILL LEVEL. RING-NECKED PHEASANTS, SHARP-TAILED GROUSE, AND RUFFED GROUSE HAVE BEEN ARBITRARILY SELECTED AS REPRESENTATIVE OF MINNESOTA UPLAND BIRDS. THEIR BIOLOGIC AND HABITAT REQUIREMENTS ARE EXAMINED. PREDATOR-PREY RELATIONS ARE ALSO STUDIED. PLANNING FOR THE WETLAND SERIES HAS NOT YET BEEN FINALIZED.

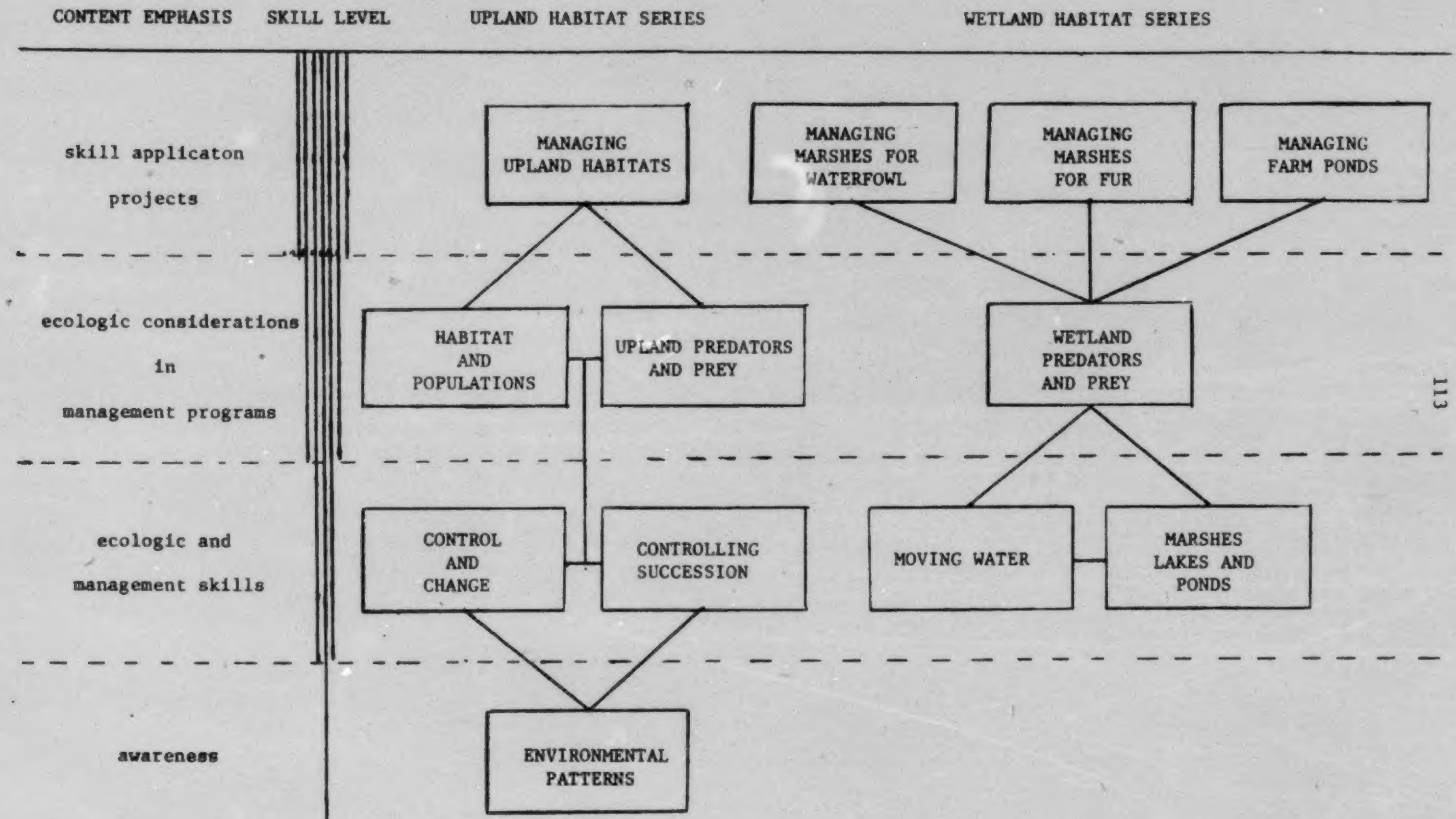

CONTENT EMPHASIS
SKILL LEVEL
UPLAND HABITAT SERIES
WETLAND HABITAT SERIES
skill applicaton projects
ecologic considerations in management programs
ecologic and management skills
awareness
MANAGING UPLAND HABITATS
MANAGING MARSHES FOR WATERFOWL
MANAGING MARSHES FOR FUR
MANAGING FARM PONDS
HABITAT AND POPULATIONS
UPLAND PREDATORS AND PREY
WETLAND PREDATORS AND PREY
CONTROL AND CHANGE
CONTROLLING SUCCESSION
MOVING WATER
MARSHES LAKES AND PONDS
ENVIRONMENTAL PATTERNS

Figure 38. Naylon (1971).

Brunckhorst (1971) (Figure 39).

> The lines of each continuum were . . . extended to opposite ends of the cube, dividing the larger cube into a series of smaller ones. Symbolics was not divided; it is naturally integrative, although there is no reason why the lines could not pass through it for expression. Figure [39] shows the overlap of the continuums of feeling--tone, geologic time and levels of matter.

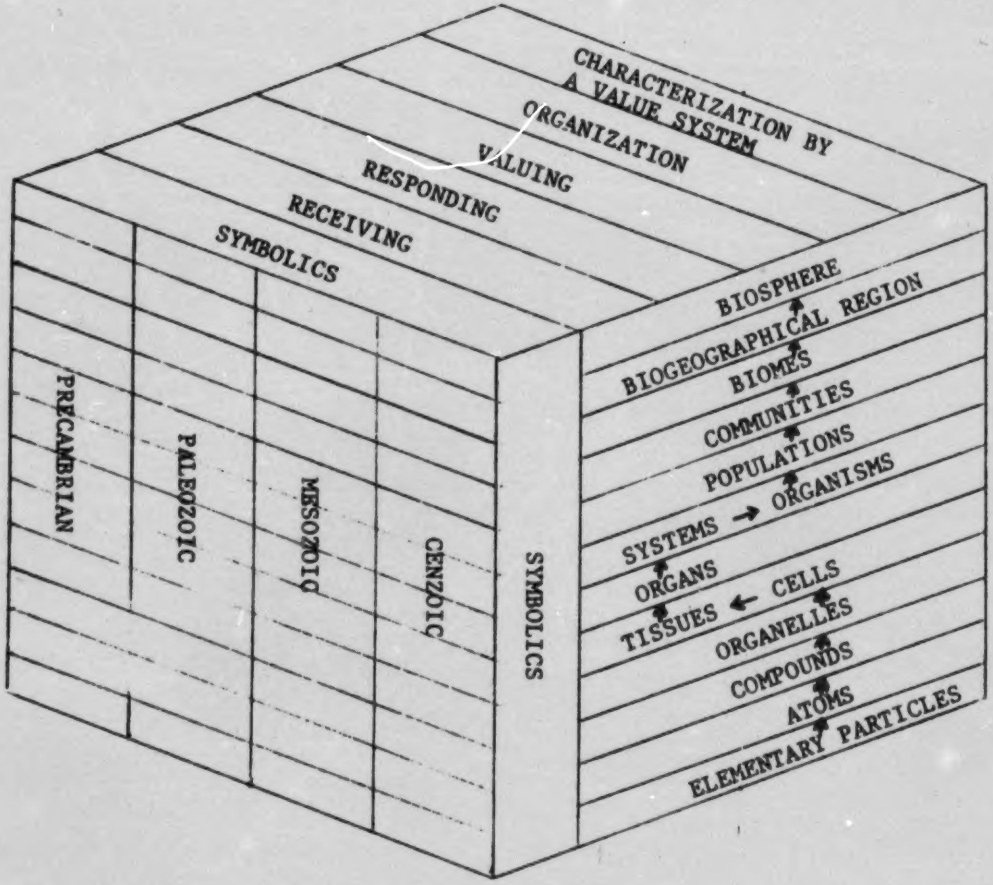

CHARACTERIZATION BY
A VALUE SYSTEM
ORGANIZATION
VALUING
RESPONDING
RECEIVING
SYMBOLICS
PRECAMBRIAN
PALEOZOIC
MESOZOIC
CENZOIC
SYMBOLICS
BIOSPHERE
BIOGEOGRAPHICAL REGION
BIOMES
COMMUNITIES
POPULATIONS
SYSTEMS → ORGANISMS
ORGANS
TISSUES ← CELLS
ORGANELLES
COMPOUNDS
ATOMS
ELEMENTARY PARTICLES

Figure 39. Brunckhorst (1971).

Christie & Newman (1973) (Figure 40).

A major educational goal is the development of student awareness and understanding of man's relationship to his environment. . . . The following discussion involves a Man-Environment-Time interaction model designed to assist in the recognition of the contribution ecological relationships make to our understanding of human health.

The make-up of the natural and human ecosystems, the biophysical and socio-cultural aspects of the environment, and their interactions with the dimensions of health (physical, mental, and ideological) as these are influenced by time, provide the basis for learning the ecological mode of analyzing any given health problem. A summary of the interaction effect on man, environment, and time can be seen in Figure [40].

Box 1--Man's physical nature is the result of heredity which responds to changes in the biophysical environment.

Box 2--All shared ways of life which constitute the socio-cultural aspects of environment, embrace norms that influence man's physical development.

Box 3--The natural, and more importantly, the man-made aspects of the biophysical environment have a direct bearing on man's mental well-being.

Box 4--The cultural demands placed on each person influence his pattern of behavior, expectations, and total personality.

Box 5--Man's technological development has disrupted his ecosystem in such a way that he is presently having difficulty responding to this challenge, due to his ideological beliefs.

Box 6--Value systems and spiritual orientations influence man's interaction with the environment.

INTERACTION EFFECT ON MAN, ENVIRONMENT, AND TIME

Health	Environment		Time
	Biophysical	Sociocultural	
Physical	1	2	
Mental	3	4	
Ideological	5	6	

Figure 40. Christie & Newman (1973).

Sparks (1974) (Figure 41).

The guidebook has been developed according to the model illustrated in figure 41 . The assumptions are that you are located in either a rural, suburban or urban setting and that certain variables are available to you. The concern of the guidebook is to help you move through each of these three levels.

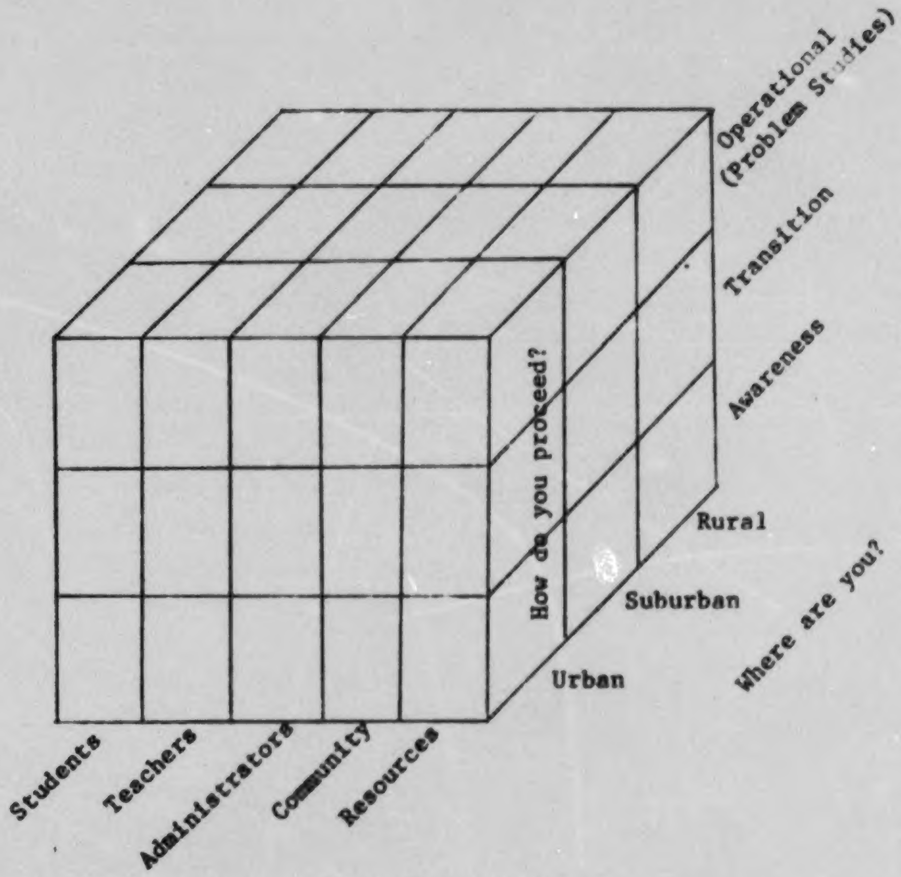

Operational
(Problem Studies)
Transition
Awareness
How do you proceed?
Rural
Suburban
Urban
Where are you?
Students
Teachers
Administrators
Community
Resources

Figure 41. Sparks (1974).

Jinks (1974) (Figures 42, 43, & 44).

> The study was conducted in three basic phases. Phase one was to identify a set of fundamental concepts underlying environmental phenomena. . . .
>
> The second phase of the study involved conceptualizing the model itself. The model was conceptualized as having three dimensions; the disciplinary dimension, the concept dimension, and the instructional systems focal point dimension.
>
> The disciplines dimension includes the social sciences, life sciences, physical sciences, mathematics, applied arts, language, and the humanities. The concept dimension includes patterns, balance, evolution, causality, and origins. The instructional system focal point dimension includes planning, conducting, and evaluating. (Figure [42])
>
> The third phase of the study involved compiling functional models for each of the disciplines included in the discipline dimension. A complete functional model was prepared for the life science discipline. Functional models of the remaining disciplines were completed only for the planning stage.
>
> The functional models are represented as two types. The Type I matrix consists of a "X" axis representing the various disciplines, a "Y" axis representing the environmental concepts, plus an additional instructional system focal point. (Figure [43]). The Type II matrix consists of a "X" axis representing the various instructional system focal points, a "Y" axis representing the environmental concepts, plus an individual discipline heading. (Figure [44]).

Concepcion-Medel (1974) (Figure 45 & 46). In figure 45, Concepcion-Medel describes an "input-output model to illustrate the contributions of environmental education to goals of national development." Figure 46 represents "a 'total' education approach to environmental education showing the contribution and interrelations of each scheme toward a social, political, economic and scientific outlook of man towards his environment." The schemes and themes Concepcion-Medel deals with in the models are covered in the conceptual framework section of this chapter.

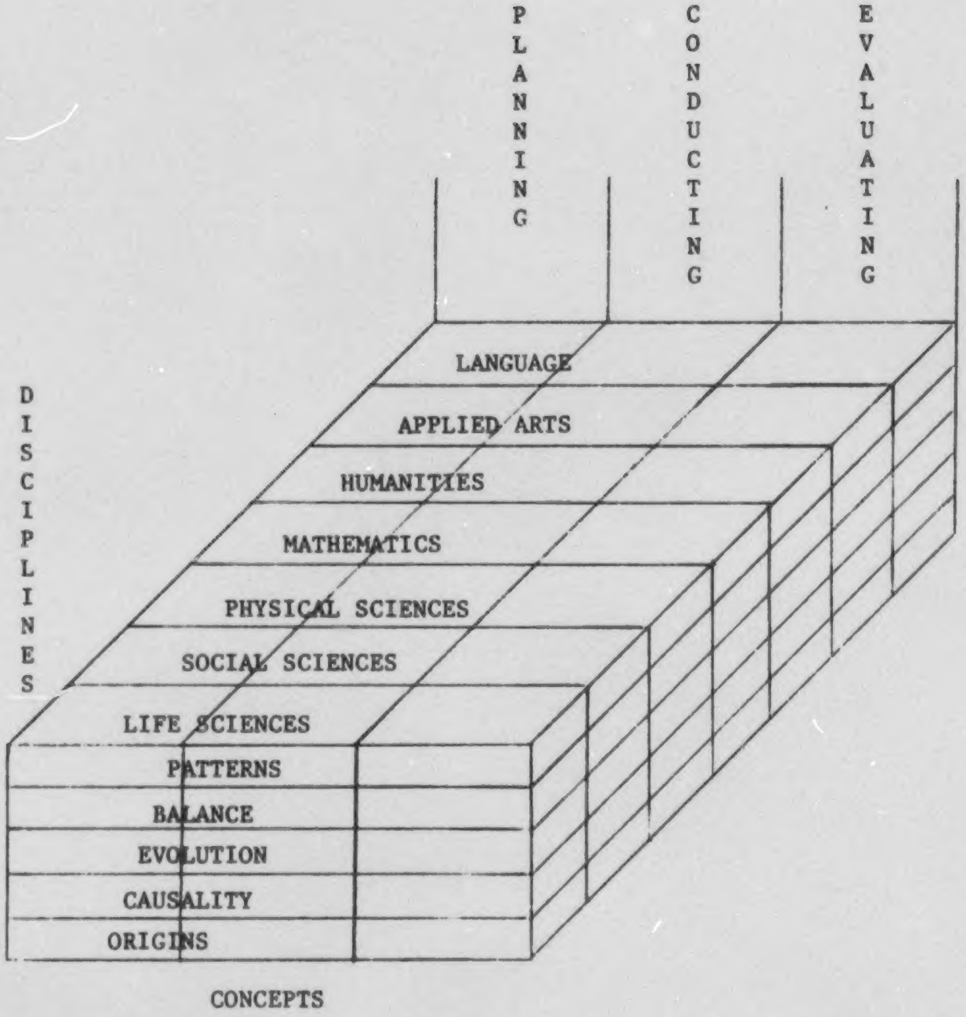

PLANNING
CONDUCTING
EVALUATING
DISCIPLINES
LANGUAGE
APPLIED ARTS
HUMANITIES
MATHEMATICS
PHYSICAL SCIENCES
SOCIAL SCIENCES
LIFE SCIENCES
PATTERNS
BALANCE
EVOLUTION
CAUSALITY
ORIGINS
CONCEPTS

Figure 42. Jinks (1974).

Disciplines

Environmental Concepts

	D_1						D_N
EC_1							
EC_2							
EC_3							
EC_4							
EC_5							
EC_6							

Figure 43. Jinks (1974).

Instructional Focal Points

Environmental Concepts

	FP_1		FP_N
EC_1			
EC_2			
EC_3			
EC_4			
EC_5			
EC_6			

Figure 44. Jinks (1974).

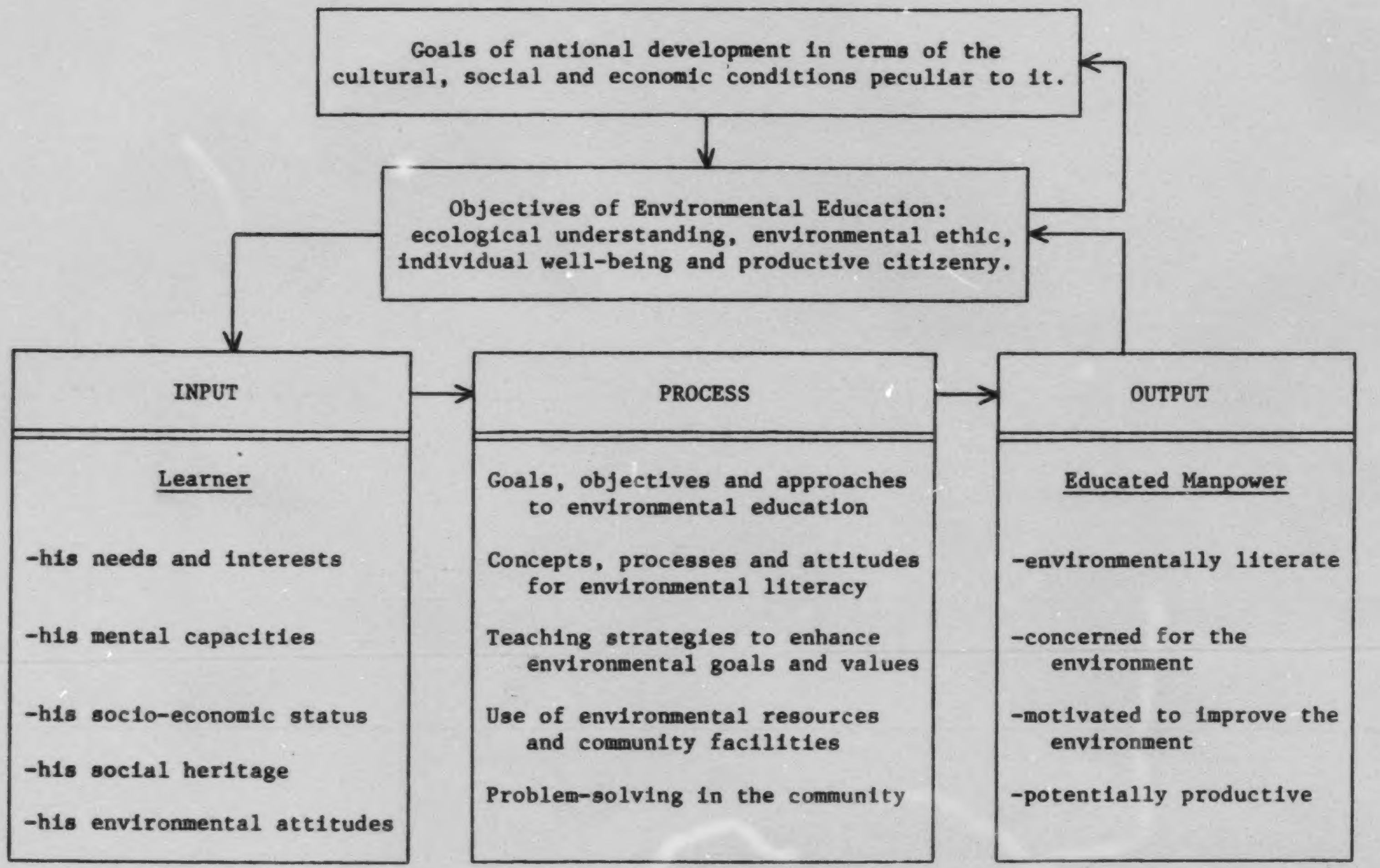

Goals of national development in terms of the cultural, social and economic conditions peculiar to it.
Objectives of Environmental Education: ecological understanding, environmental ethic, individual well-being and productive citizenry.
INPUT
Learner
-his needs and interests
-his mental capacities
-his socio-economic status
-his social heritage
-his environmental attitudes
PROCESS
Goals, objectives and approaches to environmental education
Concepts, processes and attitudes for environmental literacy
Teaching strategies to enhance environmental goals and values
Use of environmental resources and community facilities
Problem-solving in the community
OUTPUT
Educated Manpowe
-environmentally literate
-concerned for the environment
-motivated to improve the environment
-potentially productive

Figure 45. Concepcion-Medel (1974).

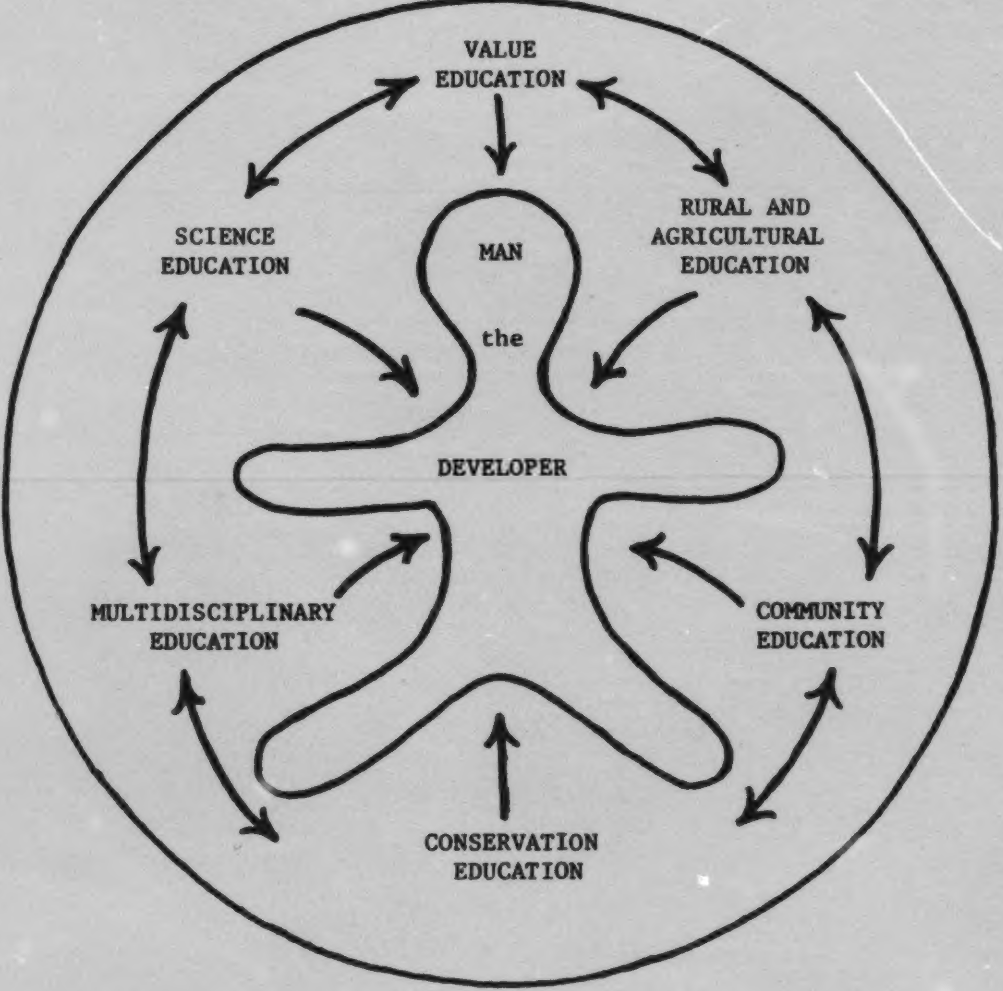

VALUE EDUCATION
SCIENCE EDUCATION
MAN
the
DEVELOPER
RURAL AND AGRICULTURAL EDUCATION
MULTIDISCIPLINARY EDUCATION
COMMUNITY EDUCATION
CONSERVATION EDUCATION

Figure 46. Concepcion-Medel (1974).

Comprehensive Paradigms

As the title implies, comprehensive paradigms pull together in a single paradigm elements from several other types of paradigms. These paradigms are attempts to express the totality of environmental education in a single "model."

Certain paradigms categorized by the researcher into other subsections were perhaps aimed at this same goal. It was determined by the researcher that such paradigms met the criteria of other subsections more appropriately than they did for the comprehensive subsection.

Walkosz (1972) (Figure 47). Based on a survey of school districts, Walkosz developed a model which considers many components.

Stapp (1974) (Figure 48). Stapp has constructed a comprehensive model of environmental education, including: philosophy, concepts, processes, teaching methods, and program emphasis.

Stapp and Cox (1974) (Figure 49). This model is very similar to the model developed by Stapp (Figure 17), but there are some modifications. Since both were published in 1974 it is difficult to be certain which is the later version of the model.

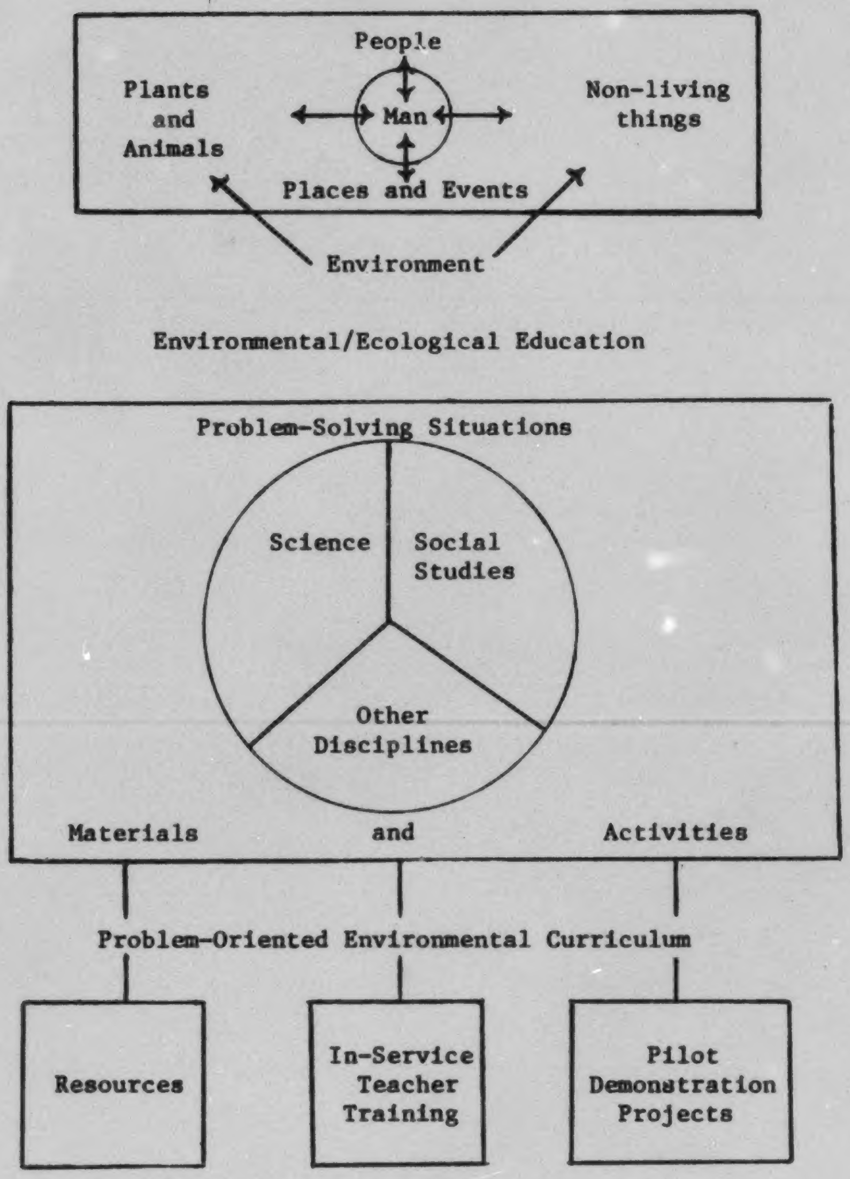
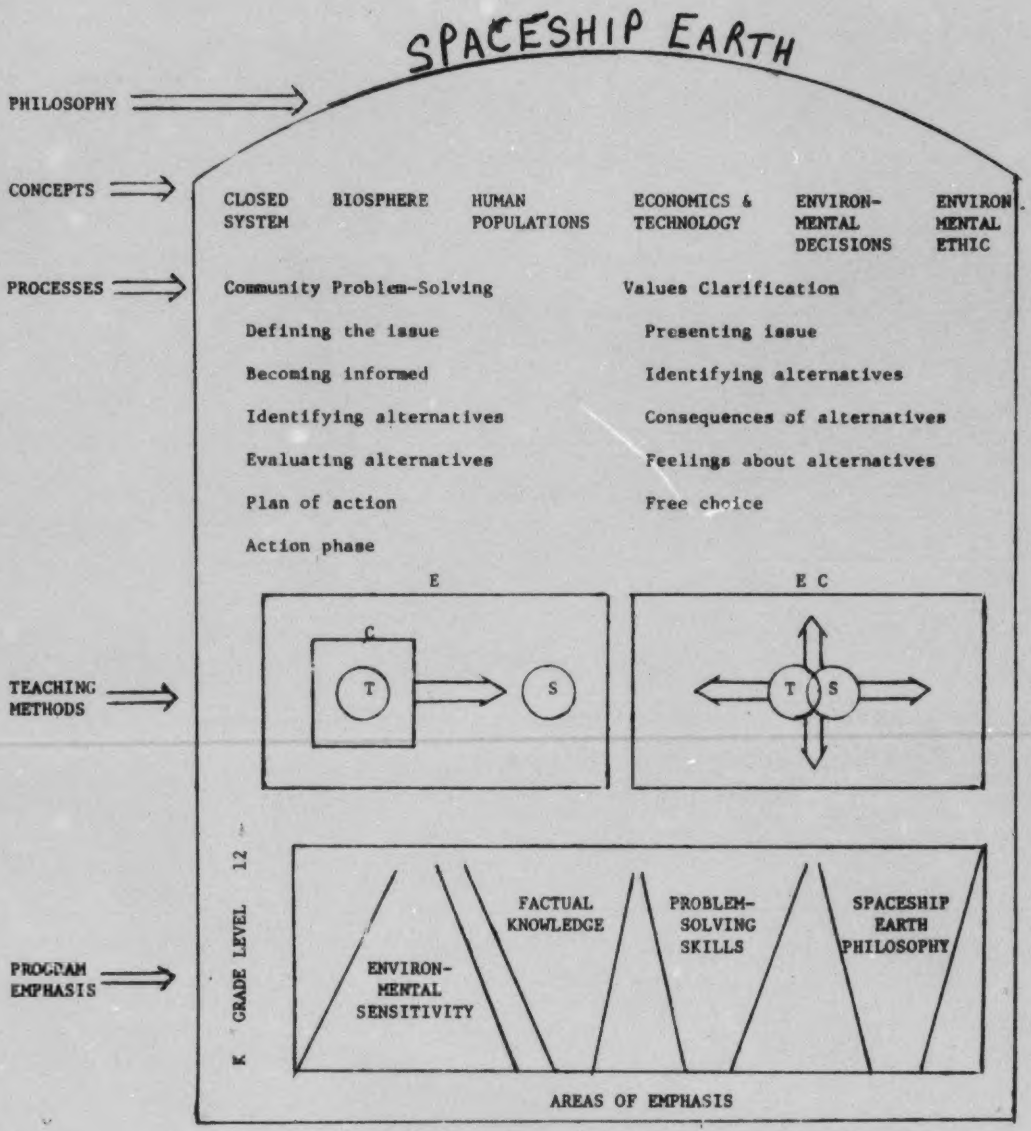

People
Plants and Animals
Man
Non-living things
Places and Events
Environment
Environmental/Ecological Education
Problem-Solving Situations
Science
Social Studies
Other Disciplines
Materials
and
Activities
Problem-Oriented Environmental Curriculum
Resources
In-Service Teacher Training
Pilot Demonstration Projects

Figure 47. Walkosz (1972).


SPACESHIP EARTH
PHILOSOPHY
CONCEPTS
CLOSED SYSTEM
BIOSPHERE
HUMAN POPULATIONS
ECONOMICS & TECHNOLOGY
ENVIRONMENTAL DECISIONS
ENVIRONMENTAL ETHIC
PROCESSES
Community Problem-Solving
Defining the issue
Becoming informed
Identifying alternatives
Evaluating alternatives
Plan of action
Action phase
Values Clarification
Presenting issue
Identifying alternatives
Consequences of alternatives
Feelings about alternatives
Free choice
TEACHING METHODS
E
C
T
S
E C
T
S
PROGRAM EMPHASIS
K GRADE LEVEL 12
ENVIRONMENTAL SENSITIVITY
FACTUAL KNOWLEDGE
PROBLEM-SOLVING SKILLS
SPACESHIP EARTH PHILOSOPHY
AREAS OF EMPHASIS

ENVIRONMENTAL EDUCATION MODEL

Figure 48. Stapp (1974).

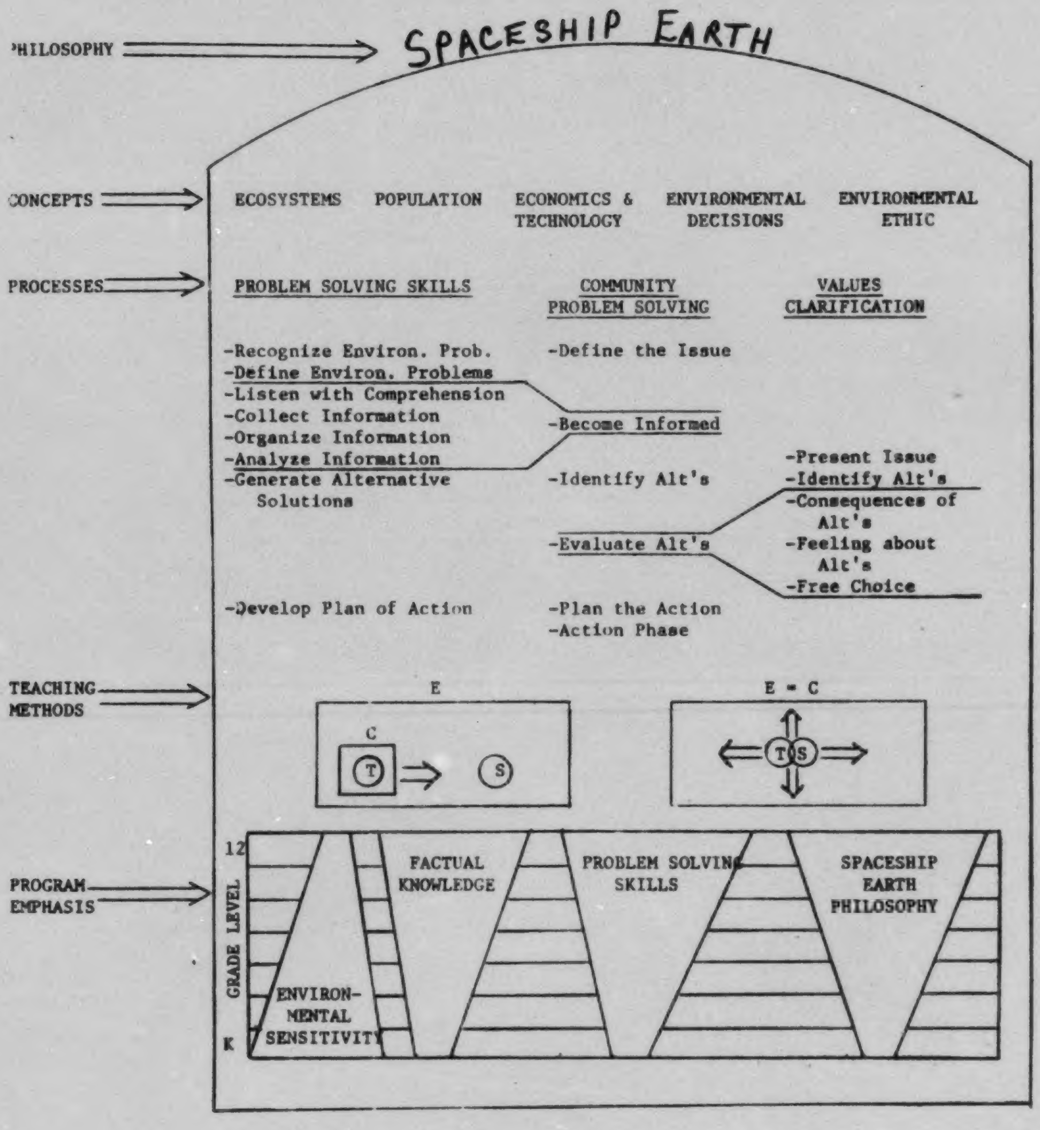

SPACESHIP EARTH
HILOSOPHY
ONCEPTS
ECOSYSTEMS
POPULATION
ECONOMICS & TECHNOLOGY
ENVIRONMENTAL DECISIONS
ENVIRONMENTAL ETHIC
PROCESSES
PROBLEM SOLVING SKILLS
COMMUNITY PROBLEM SOLVING
VALUES CLARIFICATION
-Recognize Environ. Prob.
-Define Environ. Problems
-Listen with Comprehension
-Collect Information
-Organize Information
-Analyze Information
-Generate Alternative Solutions
-Develop Plan of Action
-Define the Issue
-Become Informed
-Identify Alt's
-Evaluate Alt's
-Plan the Action
-Action Phase
-Present Issue
-Identify Alt's
-Consequences of Alt's
-Feeling about Alt's
-Free Choice
TEACHING METHODS
E
C
T
S
E - C
T
S
PROGRAM EMPHASIS
12
GRADE LEVEL
K
ENVIRON-MENTAL SENSITIVITY
FACTUAL KNOWLEDGE
PROBLEM SOLVING SKILLS
SPACESHIP EARTH PHILOSOPHY

Figure 49. Stapp & Cox (1974).

Concept Lists and Curricula

Roth and Helgeson (1972) point out that "few studies have been designed to identify conservation concepts, principles, or understandings for publis school use." The thrust of this section is to examine many of those studies which have investigated questions relating to conceptual frameworks for conservation education and environmental education. As with previous sections, the studies are divided into categories and the studies arranged essentially in chronological order within the category. They are arranged into two categories: (1) lists of concepts and concept statements, and (2) curricula with scope and sequence.

Lists of Concepts and Concept Statements

Craig (1958) discusses the large patterns of the universe in science as guidelines to teaching and learning. Although they are written for science, they have application to environmental education, and some will appear later in another work (National Park Foundation, 1972).

The universe is very large--space
The earth is very old--time
The universe is constantly changing--change
Life is adapted to the environment--adaptation
There are great varieties in the universe--variety
The interdependence of living things--interrelationship
The interaction of forces--equilibrium and balance

Geer (1958) developed many concepts related to the conservation of natural resources.

In one of the early studies geared toward identifying and developing concepts for the junior and senior high school, Visher (1959) developed a list of 477 conservation concepts. They were checked and evaluated by a jury of experts. The concepts were divided into the following groups: 78 general, 85 soils, 56 water, 55 forests, 20 grasslands, 57 minerals, 51 wildlife, 37 recreation and scenic resources, and 38 human resources. Visher claimed that "nowhere else is there such a broad, comprehensive coverage of conservation principles and concepts."

Yambert (1960) developed a framework of conservation concepts and generalizations from analyzing studies of generalizations which were related to conservation. "This was a first attempt to develop a framework of generalizations going beyond the agrarian orientation indicative of conservation teaching to this point in history" (Roth & Helgeson, 1972).

Hanselman (1963) used the existing literature as the primary source of concepts. He cites sixteen studies and publications which were used in the study. Duplicates were discarded and the refined list of 218 concepts was sent to thirty-four conservationists. The concepts were categorized and the categories rated as to importance with the higher number indicating higher importance. The concept categories and importance index is as follows: Demography and Human 29.5; General 27.1; Political 25.4; Social and Cultural 25.0; Water 24.1; Economic 22.1; Mineral 21.8; Land and Space 20.2; Soil 18.4; Forest 16.0; Plant 15.4; Recreation 13.6; Ecological 12.2; Historical 7.0; Fish and Wildlife 6.0.

Brown and Mouser (1963) provide principles and concepts in four areas: soil, water, forest and wildlife.

Stapp (1965) provides a grade level theme and set of concepts related to that theme as part of a program to integrate conservation into the curriculum K-12.

White (1967) developed a list of conservation understandings and submitted them to teachers and conservationists for evaluation. He found that 271 of the 274 concepts were deemed suitable for use in teaching with some considered more appropriate to outdoors than others.

Southern (1967) developed "twelve broad understandings . . . formulated to establish the basic framework of Natural Resources Education. These reveal the basic structure of environmental conservation."

1. Natural resources are everything man uses. They are in constant redefinition.
2. Man is dependent on the renewable resources for his survival.
3. Our industrial civilization depends on the nonrenewable resources--the metals and fossil fuels.
4. Living things are interdependent with each other and with the physical environment.
5. Man as all other living things, is subject to the laws of nature.
6. Change is a fact of environment. It is dynamic and inevitable.
7. The pressures of population and urbanization accelerate and increase resource use.
8. The amount and rate of resource use is determined by the economy.
9. Environmental quality cannot always be easily defined in economic terms.
10. Man has learned to use his environment wisely in a number of ways.
11. Government is active in the discovery, development, management, and protection of resources.
12. Everyone has the responsibility for conserving the resources around him.

Ronfeldt (1969) surveyed educators relative to conservation understandings. One hundred and four "basic urban environmental understandings important for inclusion in the elementary school curriculum" were developed in five categories: air, land use, man-made resources, water and urban ecology. Ronfeldt's conclusions included the need for environmental concepts to be incorporated into the curriculum.

Brennan (1969) suggests that there are three major concepts of conservation:

1. Living things are interdependent with one another and with their environment.
2. Organisms (or populations of organisms) are the product of their heredity and environment.
3. Organisms and environments are in constant change.

Corrado (1970) lists ten topics which are the units in a course: crisis in the environment, ecology, air, land, water, movement, noise, environmental planning, inner-city environments, and involvement and participation.

Roth (1970a), in a study designed to produce environmental management concepts, worked with scholars representing forty different disciplines. After revisions based on input from the scholars, the list was reduced to 111 concept statements. The concepts were arranged in the following categories with the number of concept statements specified in each category: environmental management 16, management techniques 8, economics 18, environmental problems 3, environmental ecology 8, adaptation and evolution 9, natural resources 18, socio-cultural environments 10, culture 4, politics 5, the family, and psychological aspects 4.

Archbald and Gundlach (1970) tallied the frequency of key words in the 111 environmental management concept statements developed by Roth. The results of this computer tabulation follow:

Frequency of occurrence	Key Words
16 or more	Environment, Man, Populations, Resources, Use (Utilize)
11-15	Economic, Increase, Management, Natural Resources, Social, Technological
8-10	Conservation, Culture, Development, Individual, Knowledge, Life, Needs, Values
6-7	Affect, Change, Energy, Factors, Land, Natural (Nature), Processes, Produce (Productivity), Risks, Science, Water
5	Ability, Biological, Human, Levels, Long-Range, Minerals, Others, Plant, Policy, Political, Public, Society

In another study based on Roth's 111 concept statements, Cauley (1971) applied them to industrial arts teaching and concluded that 52 of the concepts were applicable to industrial arts at the 66 per cent level. The teaching areas are: metals, plastics-crafts, graphic arts, drafting, power, and woods.

Stegner (1971) suggests that "a conceptual scheme for population-environment education should include these basic concepts:"

I. The earth is a finite natural system. (To show that there are limits.)

II. The evolution of the primates resulted in a capacity for culture. (To relate man to the natural system.)

III. The natural system influenced the evolution of human culture. (To indicate man's dependence on the natural system.)

IV. Cultural evolution led to dominance of the environment. (To indicate man's uniqueness and power.)

V. The activities of human populations man lead to conditions restricting the quality of life. (For awareness of population-environment problems.)

VI. By planning with the natural system, a life of acceptable quality can be provided for all people. (To suggest some choices.)

The National Park Foundation (1972) utilizes several of the concepts first used by Craig (1958) in the publication describing the National Park Service NEED Program. The elements are: variety and similarity, patterns, interactions and interdependence, continuity and change, and adaptation and change.

Troost and Gottlieb (1972) suggest a curricular framework should consider the following points which are said to be "very useful starting points:" ecology, geography, man and energy, pollution, technology and pollution, political problems, and ethical values.

Isabell (1972) presents an excellent review of the literature relative to conservation and environmental education concept development. More than a dozen studies and reports are cited and reviewed.

He suggests that since there seem to be very long lists, (e.g., Visher with 477), or very short lists, (e.g., Brennan with 3), there was a need for comprehensive, moderate length lists, so produced the following:

1. Life exists at various levels of organization.
2. Free energy is required to maintain life at various levels of organization.
3. Green plants occupy the key position in the material and energy cycles of an ecosystem.
4. Living systems tend toward stability.
5. Energy is transferred inefficiently throughout an ecosystem.
6. The stability of an ecosystem is directly related to the diversity and multiplicity of species comprising it.
7. Life systems evolve.
8. All components of the living and non-living environment, including man, are interdependent.
9. The biosphere is a closed, finite system characterized as having limits.

Based on these concepts, Isabell went on to suggest some human implications.

> Man is an integral part of the environment, subject to the same natural laws as are other life forms.
>
> Indiscriminate intrusions of technology on the environment often have detrimental effects.
>
> Control of environmental pollution is essential for the welfare of human and all other living things.
>
> Economic growth for its own sake is unwarranted.
>
> Production and consumption of commodities constitutes only a small part of man's humanity.

Bogan (1973) describes the "areas of the natural and man-built environment selected by the Office of Environmental Education (OEE) as suitable areas of enquiry for projects eligible for funds under the Environmental Education Act," which include:

> the import of the application of scientific and technological findings; human settlements--urban, suburban, rural; food production; energy production; population dynamics; transportation, planning--urban, suburban, rural; air; water--aquatic, estuarine, marine; land use and other resource utilization, allocation, depletion, and conservation, environmental pollution.

Rentsch (1973) has an extensive review of the literature relative to concept formation, and conservation and environmental education concept development studies. Rentsch developed environmental concept categories and component concepts which were suggested to be minimal understandings for an environmentally literate citizen. The ten concept categories are: "Spaceship Earth Closed System, Biosphere, Human Ecosystem, Change, Environmental Quality, Population, Environmental Degradation, Recycling, Land Ethic, and Decision Making."

The National Association for Environmental Education (1973) published a set of units which, the Association suggested, provides the scope for a secondary school curriculum in environmental studies. The twenty topics in the publication are:

1. The environment and the identification of environmental problems
2. Air pollution
3. Environment: Government, law and social aspects
4. The economics of environmental problems and solutions
5. Population and the environment
6. The international dimension of environmental issues and ecological reality
7. The individual and what we can do
8. Transportation and the environment
9. Urbanization
10. Sound pollution
11. Land development and land use planning
12. The problems of solid waste and recycling
13. The past and planning for the future
14. Foods, additives, pesticides, herbicides, drugs and the environment
15. Wildlife
16. Environmental ethics
17. Technology: servant or master
18. Soil pollution
19. Water pollution
20. The energy crisis and the depletion of natural resources

Gargasz (1973) suggests that "one might assume that life on earth revolves around three conceptual axes:

1. Biotic and abiotic (living and non-living) things are dependent on each other for the maintenance of a balance of nature. . . .

2. There is an interrelationship among and between all living things.
3. The environment sets the upper limits in which heredity can work. . . .

Project I-C-E (Warpinski, 1973) out of Green Bay, Wisconsin, has developed 12 major environmental concepts:

1. Energy from the sun, the basic source of all energy is converted through plant photosynthesis into a form that all living things can use for life processes.
2. All living systems interact among themselves and their environment, forming an intricate unit called an ecosystem.
3. Environmental factors are limiting on the number of organisms living within their influence, thus each environment has a carrying capacity.
4. An adequate supply of pure water is essential to life.
5. An adequate supply of clean air is essential to life.
6. Natural resources are not equally distributed over the earth or over time, and greatly affect the geographic conditions and quality of life.
7. Factors such as facilitating transportation, economic conditions, population growth, and increased leisure time have a great influence on changes in land use and centers of population density.
8. Cultural, economic, social, and political factors determine the status of man's values and attitudes toward his environment.
9. Man has the ability to manage, manipulate, and change his environment.
10. Short-term economic gains may produce long-term environmental losses.
11. Individual acts, duplicated or compounded, produce significant environmental alterations over time.
12. Private ownership must be regarded as a stewardship and should not encroach upon or violate the right of others.

Concepcion-Medel (1974) provides a review of some of the previous studies in addition to some not cited here. Subsequently, Concepcion-

Medel suggests the "conceptual scheme for environmental education should include these major themes:"

I. Living things are interdependent with one another and with their environment.

II. Organisms (or populations of organisms) are the product of their heredity and environment.

III. Organisms and environments are in constant change.

IV. When matter changes from one form to another the amount of matter remains unchanged.

V. The economy of a region depends on the utilization of its resources and technology.

For each of the themes, Concepcion-Medel proposes grade level understandings, and lists them for the first theme.

Cochran and McCrea (1974) developed the following concept statements related to population:

a. Mathematical science is an integral part of demography.

b. Population growth is a world problem.

c. Population pressures exacerbate urban problems.

d. Family size and composition affect individuals.

e. Individual acts have demographic consequences.

f. The world's resources are finite.

Sweeney (1974) suggests that there are five variables in the world system: population, capital investment in industry, pollution, non-renewable natural resource usage, and food production.

Ambry (1975) describes a Computer Based Resource Unit system for New Jersey. At the time of writing, thirteen units were available. A listing of the units available to teachers follows:

Environment and the Quality of Life: Population
Environment and the Quality of Life: Natural Resources
Environment and the Quality of Life: Industrial-Economic Impact

Environment and the Quality of Life: Pollution
Environment and the Quality of Life: Land Use
Environment and the Quality of Life: River Basin (Case Study)
Environment and the Quality of Life: A Pine Barren (Case Study)
Environment and the Quality of Life: Wetlands (Case Study)
Environment and the Quality of Life: Energy-Technology
Environment and the Quality of Life: Energy-Society
Environment and the Quality of Life: Energy-Transportation
Environment and the Quality of Life: Primary Ecology
Environment and the Quality of Life: Environmental Law

Engelson (1975) reports on a Resource Guide developed by an "interdisciplinary, K-16 group in a summer workshop and is used to develop inservice courses for teachers at the local district level." The Resource Guide is based on nine components of environmental education:

perceptual awareness
conceptual understanding of the natural environment
conceptual understanding of the man-made environment
aesthetic discrimination
values clarification
humanism
fostering creative abilities and attitudes
organizational skills and knowledge
decision-making

Stapp (1975) suggests that

> to produce an environmentally literate, responsive and responsible citizenry, our task is to help every teacher more clearly comprehend the basic concepts and understandings that undergird and support the philosophy of living in harmony with, and within, our environment. Some of the concepts and understandings follow:
>
> Closed system (5 concepts)
> Biosphere (3 concepts)
> Human populations (8 concepts)
> Economics and technology (4 concepts)
> Environmental decisions (5 concepts)
> Environmental ethics (4 concepts)

VandeVisse and Stapp (1975) suggest that basic concepts and understandings can be divided into sub-components:

> Cognitive Sub-Goals--to assist the participant in acquiring a basic understanding of the following concepts that support and undergird the philosophy of Spaceship Earth. Closed System;

Ecosystem; Human Ecosystem; Land Ethic; Population; Environmental Quality; Environmental Decisions.

Affective Sub-Goals--to assist the participant in developing a concern for the quality of the environment and a motivation to help resolve environmental problems. Some important affective components that the program should assist the participants in developing are the following: Interest in his or her environment and its relationship to society; Sensitivity (total awareness) to his or her environment, both natural and man-made aspects of it; Sensitivity to the quality of his or her environment and ability to recognize environmental problems.

Skill-Behavior Sub-Goals--to assist the participants in developing critical thinking and action skills necessary for them to help prevent and solve environmental problems. Specifically, the program is designed to assist the participant in acquiring these four important skills:
The skill to think critically. . . .
The skill of valuing. . . .
The skill of solving problems. . . .
The skill of change strategy. . . .

Matthews (1976) has divided the 'field' of environmental management into the following subject areas:

Values and Perceptions
Ecology
Environmental Effects
Environmental Indicators
Environmental Impact Assessment Methodology
Modeling
Monitoring
Growth and Its Implications for the Future
Economics of Externalities
Environmental Law
Administrative Processes

The Belgrade Charter (1976) states that the guiding principles of environmental education are:

1. Environmental education should consider the environment in its totality--natural and man-made, ecological, political, economic, technological, social, legislative, cultural and esthetic.

2. Environmental education should be a continuous life-long process, both in-school and out-of-school.

3. Environmental education should be interdisciplinary in its approach.

4. Environmental education should emphasize active participation in preventing and solving environmental problems.

5. Environmental education should examine major environmental issues from a world point of view, while paying due regard to regional differences.

6. Environmental education should focus on current and future environmental situations.

7. Environmental education should examine all development and growth from an environmental perspective.

8. Environmental education should promote the value and necessity of local, national and international cooperation in the solution of environmental problems.

Curricula with Scope and Sequence

Several states have produced guides to the study of conservation. One which has had wide recognition is that produced by Ohio (Dambach & Finlay, 1961). It is divided into primary, intermediate, and upper elementary with concepts in six areas: general, mineral, soil, water, plants, and animal resources.

Brandwein (1966) produced a curriculum scheme with scope and sequence. Within each of the conceptual schemes, understandings are designated for different levels. The conceptual schemes are:

A. Energy may be transformed; it is neither created nor destroyed.

B. Matter may be transformed; in chemical change matter is neither created nor destroyed.

C. Living things interchange matter and energy with the environment (and with other living things).

D. A living thing is the product of its heredity and environment.

E. Living things are in constant change.

F. The universe is in constant change.

Brandwein (1971) presents an integrated curriculum, Ekistics.

> Concepts and values are anvils on which philosophies, policies, and practices are forged. But meanings, understandings, concepts, and values must be related in a structure; in effect, a curriculum constructs a kind of human ecosystem in which the various parts are interrelated. That is, a school has structure and it develops educational structure through curriculum. To "see" and understand structure is to see the interrelatedness of things.

In the Ekistics curriculum, components of which are quoted below, three areas are emphasized: science, social studies and humanities. Within each area, there are six levels, a cognitive-affective scheme, and a conceptual pathway.

Science

Level
6. Man is the prime agent of change of the "natural" environment.

5. The environment is in constant change, in present and past ages.

4. Life converts matter and energy into characteristic species forms.

3. Life and environment interchange matter and energy.

2. There are a variety of environments, each with characteristic features and life.

1. In any environment, living things have similar needs.

Cognitive-affective scheme--Man is interdependent with his natural and physical environment.

Conceptual Pathway A--Interdependence--In interchange of matter and energy.

Social Studies

Level

6. Man modifies the environment in order to utilize his resources and increase them.

5. Social aims determine the utilization of resources.

4. Men interact to utilize the world's available resources.

3. Men utilize the environment to secure their needs.

2. Men develop different modes of adaptation to life in different environments.

1. Men live in different environments.

Cognitive-affective scheme--Man's social behavior is basic to maintaining, altering, adapting, or destroying the environment.

Conceptual Pathway B--Interdependence--In social interaction.

Humanities

Level

6. Men recreate the environment.

5. Men create objects, events, and behaviors which satisfy their images of beauty and order.

4. Cultures are characterized by their special ways of reacting to the environment.

3. Men, responding to social environments, create objects and events symbolic of this interaction.

2. Men seek out objects, events, and behaviors symbolic of beauty.

1. Men interact mentally and emotionally to the objects and events in their environment.

Cognitive-affective scheme--Man utilizes his symbolic and oral traditions to maintain or alter the environment.

Conceptual Pathway C--Interdependence--In cultural components and forms.

The National Association for Environmental Education (1973a) developed a curriculum for the intermediate grades. Each grade level

(4-8) deals with the same four clusters and modules within clusters, but each grade level has a different topic within the module.

Cluster A--Environment and the individual
  Module I: Values and environmental awareness
  Module II: Environmental rights and responsibilities of individuals and groups

Cluster B--The web of life
  Module I: Dependence of all living things on each other and the environment for survival
  Module II: Energy and the biosphere's systems

Cluster C--The city as an ecosystem
  Module I: The city: A complex ecosystem requiring planning and resources
  Module II: The man-made environment and the quality of life
  Module III: Population dynamics
  Module IV: The effect of the rural ecosystem on urbanization

Cluster D--Spaceship earth--Natural resources management
  Module I: Production, consumption and recycling--intelligent use of natural resources
  Module II: Decision making

The Self Earth Ethic (SEE) program components are arranged horizontally and vertically. The horizontal arrangement is from level one to level eight. The vertical arrangement includes the following: living things, needs of living things, meeting needs and wants, problems from meeting needs and wants, solving problems, and man's moral responsibility (Hart & Turner, 1974).

Course(s) Approach

Several courses and course sequences have been identified which have been or are being used to provide environmental education instruction. In many cases, the content outline will provide additional information about the substantive structure of environmental education as it is perceived by the person(s) describing the course. As with some other sections, this will be arranged essentially in chronological order.

In 1968 the "Conservation Foundation Committee on Environmental Education in American Universities conducted research into the availability of courses and programs" (Havlick, 1969).

> In order for a course to be considered relevant to environmental education, it was decided that the course must fall into at least one of the following four categories:
>
> 1) the course must be a so-called "building block"--that is, it must contribute to a better understanding and knowledge of the physical-biological environment,
>
> 2) the course must be an "integrator" or relate man to his environment,
>
> 3) it must be a techniques or problem solving course which teaches problem solving techniques and stimulates students to work towards the solution of problems facing their environment, and
>
> 4) any remaining courses which were believed relevant to environmental education, but did not fall into the above categories.

Corrado (1970) suggests that a one-course approach is not a substitute for other approaches, but that it may serve as an overview of environmental problems, and help provide the framework for a more comprehensive treatment. He suggests ten topics for the course, then goes on to specify outside readings, assignments, and other components. The topics are: (1) Crisis in the Environment--Man and His Relation to Nature; (2) Ecology; (3) Air; (4) Land (Congestion, solid waste, open space, city-scape); (5) Water; (6) Movement; (7) Noise; (8) Environmental Planning; (9) Inner-city Environments; (10) Involvement and Participation.

McKenna (1973) describes a course in human ecology taught at the City College of New York which is broken into three basic sections. The first is issues, the second is problem research, and the third is an action project. The course is interdisciplinary in planning and in the make-up of participants.

Branson (1972) provides a detailed outline for a thirty-six week long course as "a suggested program in educating the youth of America to the dangers that face them, with an overview of correction." The outline provides objectives, ecological concepts with activities, and both concepts and activities for the following topics: Air, land, water, natural resources, lessons of history, pesticides, wetlands drainage, degradation of the prairies, water pollution, other aspects of water, air pollution, mountains, political aspects, the population crisis, environmental education, field and laboratory exercises, and independent study programs.

Morgan, Moran, and Wiersma (1973) suggest the need for an introductory environmental science course for non-science majors. "Only those fundamentals that are directly relevant to the environment are presented."

> After presentation of basic concepts, the environment is subdivided into four spheres: the lithosphere, atmosphere, hydrosphere, and biosphere. The components and processes of each sphere are studied. Man's activities are then considered as they interact with these components and processes. Although each sphere is initially studied separately, emphasis is placed upon the interdependence of the spheres.

Mayer and McKenzie (1974) describe a summer institute offered by The Ohio State University based on three themes: "Theme I: Interdisciplinary nature of environmental problems, Theme II: Development of attitudes favorable to environmental action, Theme III: Utilization of alternative forms of learning." They describe activities, readings, and the use of "mini-projects," each of which require about a half day.

Kupchella and Levy (1975) describe a course which they suggest has the "basic principles in the education of environmentalists." They further suggest that an understanding of the basic principles of ecology "is the key to an understanding of environmental problems." The course was designed for adult environmental activists.

Hungerford and Litherland (1975) describe an investigative approach to environmental education. The course is divided into five modules:

1. Looking into Environmental Problems
2. Studying Environmental Problems Using Secondary Sources
3. Using Surveys, Questionnaires, and Opinionaires in Environmental Science
4. Interpreting Data in Environmental Science
5. Studying an Environmental Problem

This course is essentially different from the others in that it is geared to skill building not content. The goal is to have the students develop sufficient skill to become autonomous learners in the area of environmental problems.

Supplemental and Other Approaches

This section deals with "supplemental" approaches, i.e., they may be units, guidebooks or other materials which are perceived, by the author of the material, to be relevant to environmental education. In a sense, this section contains materials which did not fall into one of the other categories, but which may help describe components of the substantive structure of environmental education.

As with previous sections, this is a sampling of the field, not a comprehensive or exhaustive review. Also, as before, the materials are arranged essentially in chronological order.

Strader (1965) developed a sourcebook for teaching conservation in the science program. He developed extensive units on soil, water, wildlife and forests, as well as human resources.

Stapp (1970) describes "environmental encounters" which are opportunities for human interaction with the environment. According to Stapp, they should be developed by the teacher and class together, and consist of a set of instructional objectives and activities.

Sharron (1972) developed a manual for group discussion of the problems of environmental management. He divided the manual into the following sections: ecological overview, overpopulation, air pollution, water pollution, effects of pesticides and chemicals, nuclear hazards, disposal of solid waste, abuse of natural resources, excessive noise, citizen action and education.

Walser (1973) developed Environmental Education, Kindergarten through Grade Twelve: A Resource Guide for Teachers. This 200+ page guide covers a variety of topics at various grade levels.

Hardy (1973) developed several units which are used in curriculum and educational methods courses for social studies teachers.

Howell and Warmbrod (1974) suggest that "an environmental protection course is needed in schools to help students to not only identify environmental problems, but also to discover how they can contribute to the solution." They developed a unit for high school students with these topics: our complicated environment, our lakes and rivers, our refuse problems, population, chemicals in our environment, air and pollution, vanishing wildlife, minerals--how limited are they?

Research using the manual indicated there was not a significant difference between students using and students not using the manual; however, an interesting item reported was that "there was a positive relationship between the number of professional environmental education courses completed by the instructor and the students' posttest attitude inventory scores."

Sweeney (1974) developed a social studies unit, designed for four to six weeks of study which examines the forces which historically and currently affect the quality of the world environment. The materials focus on the world-wide implications of environmental decision-making in the local community." Sweeney further suggests that "environmental education should equip students with an effective problem-solving model. . . . They must recognize the logical implications of their actions and of the values they hold."

Tanner (1974a) states that "there is wide agreement that EE must be integrated into the existing curriculum at all grade levels and in all subjects." Tanner footnotes this statement and "Footnote 1" reads, "My notes contain references to nineteen articles, books, or other materials which state this opinion." He does not list those sources.

In addition to the sources cited in other sections, the researcher has identified specific references to the need for integration or infusion of environmental education into the curriculum in a number of works, including the following: Aldrich and Blackburn (1975); Brandwein (1966); Capps (1941--Cited in Callison, 1953); Cauley and Groves (1974); Department of Health, Education, and Welfare (n.d.); ECOS Training Institute (1974); Harrah and Harrah (1975); Hawkins (1970); Keach (1973); NSTA (1970); Schafer and Disinger (1975); Schultz (1975); Stapp (1964, 1965, 1974a); Tanner (1974b); VandeVisse and Stapp (1975).

Summary

Chapter II is a review of the literature. The major components reviewed include the history and background of environmental education, definitions of environmental education, and approaches to environmental education. The approaches to environmental education are divided into five areas: position papers, paradigms, concept lists/curricula, course(s), and supplemental/other.

Within each of the categories materials are arranged chronologically or by category. The materials are cited in this chapter, and no analysis or synthesis is attempted. In Chapter III, which follows, appropriate components will be analyzed and synthesized.

Chapter III

AN ANALYSIS AND SYNTHESIS OF THE DATA

Part I: Definitions of Environmental Education

The purpose of Chapter III is analysis and synthesis of the data collected in Chapter II. Since the history and background section is provided for the purpose of providing context, it was not directly involved in the analysis and synthesis of the data. The section of Chapter II dealing with definitions of environmental education, and the section dealing with approaches to identifying and delineating the substantive structure of environmental education, were each analyzed and synthesized in this chapter.

The data related to definitions were handled (i.e., analyzed and synthesized) apart from the data related to substantive structure, although in a similar manner. All analysis and synthesis of data related to definitions of environmental education was completed prior to dealing with the research questions or data related to substantive structure of environmental education.

Since the research questions deal specifically with the definition of environmental education, the analysis and synthesis began with those research questions. Each research question was asked, and to the extent possible at this point in the study, each was answered. Based on the evaluation of the research questions, specific procedures for analysis and synthesis of the data related to definitions of environmental education are delineated. These procedures led to a complete answer of the research questions related to definition of environmental education.

Research Questions Related to the Definition of Environmental Education

Research question "1a" asked, "Based on a search of the literature, and other sources, what are the professional perceptions relative to the following: (a) operational definitions of environmental education?" The definitions cited and quoted in Chapter II provide an answer to this research question. ["1b" refers to substantive structure and is answered later in this chapter.]

Research question "2a" asked, "Based on an analysis of the data compiled from the literature, and other sources, is it possible to identify the following: (a) a generally acceptable operational definition of environmental education?" The answer is no, there is no single operational definition of environmental education which is generally accepted in the literature. In fact, at a recent (July 1975) conference of more than 80 environmental educators from across the country, the group report from elementary and secondary education states that one of the reasons for so little progress in many areas of environmental education is that "consensus has not been reached on definition" (Schafer and Disinger, 1975). ["2b" refers to substantive structure and is answered later in this chapter.]

Research question "3" asked, "If, in fact, there is no agreement relative to an operational definition of environmental education, can one be constructed which mediates the differences?" Based on a thorough review of the data, and considering in particular words and phrases which recur, a definition of environmental education was constructed.

Procedures for the Analysis and Synthesis of the Definitions of Environmental Education

In the analysis and synthesis of the definitions of environmental education quoted in Chapter II, the researcher had the following objectives:

(1) Identify key words and phrases which occur in the definitions of environmental education.

(2) Determine the relative number of times these key words and phrases occur in the definition of environmental education.

(3) Construct a definition of environmental education which appears educationally sound in terms of the overall goals of environmental education.

The specific procedures employed to reach the objectives, and a rationale for each of the procedures, follow:

Step number one. All articles, conjunctions, and prepositions were eliminated from consideration as key words and phrases.

Rationale for step one. As connectors and modifiers, such parts of speech do not generally carry the major meaning in a sentence.

Step number two. The remaining words (e.g., nouns, verbs, adjectives, and adverbs), which are indeed the key words, were tallied in the following manner:

(1) As a definition was read by the researcher, a key word or phrase was identified from the available nouns, verbs, adjectives, and adverbs. Identification of key words and phrases was determined by its perceived

validity as environmentally and/or educationally significant.

(2) The researcher wrote the key word or phrase on a separate sheet of paper. The author and date of publication of the reference within which the definition is located were noted beside the key word or phrase.

(3) The researcher continued reading the definition. Additional key words and phrases were identified. Each newly identified key word or phrase was added to a running list of key words and phrases. The author and publication date of the reference within which the definition is located were noted beside the key word or phrase on the running list.

(4) The researcher repeated (1), (2), and (3) above with each subsequent definition of environmental education quoted in Chapter II.

Each previously identified key word which is used in subsequent definitions is noted by adding the author's name and date of publication of the reference containing the definition to the running list beside the key word or phrase.

Rationale for step two. The researcher's seven years of active involvement in environmental education has included extensive reading of the professional literature where certain words and phrases are used repeatedly by authors in the field. These terms are part of the researcher's environmental education vocabulary. Therefore, the researcher is, in effect, using his familiarity with professional terminology as a criterion for selecting key words and phrases.

Further, nouns, verbs, adjectives, and adverbs are the parts of speech which carry the meaning of the definition; therefore, they are considered to be integral elements in the definition of environmental education.

Step number three. In order to determine the relative number of uses for each key word or phrase, the researcher counted the number of references to each key word and phrase on the running list. Based on that data, the researcher constructed Table 1. Table 1 specifies, in the left column, the number of times the key word or phrase was cited in the definition of environmental education quoted in Chapter II. The key words and phrases are in the right column, opposite the number of times they were cited.

Rationale for step three. The key words and phrases which are cited most often will tend to be the most pervasive words for defining environmental education.

Step number four. Utilizing primarily the most often cited key words and phrases, a skeleton definition of environmental education was constructed. Subsequently, the researcher, with input from competent professionals in the field, modified the original, unwieldy definition through the use of synonyms and by subsuming several words and phrases within a more inclusive word or phrase.

Rationale for step four. A computer could identify and tally key words and phrases, and synthesize a definition based on the number of times each key word or phrase occurs; however, the essential factor is creating a whole which is greater than the sum of the parts. The human mind excels in the creative endeavor while the computer is limited to mechanical manipulation.

At this point it appears cogent to identify one of the limitations imposed by the researcher regarding the key words and phrases used in the definitions of environmental education. The key words and phrases are simply that, words and phrases. Each person cited may have used the word or phrase differently from every other person who used the same word or phrase. No attempt is made to operationalize the key words and phrases, nor to specify that the key word or phrase should be used or interpreted in a particular way. The method used is simply to establish consensus on the use of key words and phrases to provide a foundation for developing an educationally sound definition of environmental education.

Procedurally, in the pages that follow, the key word or phrase is underlined and the individuals who used the key word or phrase in their definition of environmental are cited with it, by name and date of publication. The key words and phrases are arranged alphabetically, as are the names of individuals cited for each of the key words and phrases.

Key Words and Phrases

Action/Activity references include: Bogan (1973); Concepcion-Medel (1974); Department of Health, Education, and Welfare (n.d.); ECOS Training Institute (1974); Griffith, Landin, & Jostad (1971); Hawkins & Vinton (1973); Smith (1970); Ulrich (1974); and Walsh Project Committee (1969).

Attitude references include: Brennan (1970, 1973); Concepcion-Medel (1974); Conservation Education Association (1970); Horn (1970); Northern Illinois University-in Brennan (1973); Ulrich (1974); Welsh Project Committee (1968).

Awareness references include: Aldrich & Blackburn (1975); Concepcion-Medel (1974); Department of Health, Education, and Welfare (n.d.); Editor (1969); Educational Products Information Exchange (1971); Griffith, Landin, & Jostad (1971); Hawkins & Vinton (1973); Hernbrode (1975); and Stapp, et al. (1969).

Biophysical references include: Concepcion-Medel (1974); Horn (1970); Northern Illinois University-in Brennan (1973); and Stapp, et al. (1969).

Citizen/Citizenry references include: Concepcion-Medel (1974); Dana (1969); Department of Health, Education, and Welfare (n.d.); Griffith, Landin, & Jostad (1971); Hawkins & Vinton (1973); Hernbrode (1975); Smith (1970); and Stapp, et al. (1969).

Concern/Concerning references include: Concepcion-Medel (1974); Department of Health, Education, and Welfare (n.d.); Griffith, Landin, & Jostad (1971); Hernbrode (1975); Horn (1970); Northern Illinois University-in Brennan (1973); Stapp, et al. (1969); and Zeitler (1974).

Decision-making/Decisions references include: Bogan (1973); Concepcion-Medel (1974); Department of Health, Education, and Welfare (n.d.); Hawkins & Vintin (1973); Horn (1970); McGowan & Kreibel (1975); and Northern Illinois University-in Brennan (1973).

Environment references include: Aldrich & Blackburn (1975); Brennan (1970); Concepcion-Medel (1974); Dana (1969); Department of Health, Education, and Welfare (n.d.); Editor (1970b); Griffith, Landin, & Jostad (1971); Hawkins & Vinton (1973); Hernbrode (1975); Hill & White (1969); Horn (1970); Jinks (1974); McInnis (1972); Southern (1969); Stapp, et al. (1969); Welsh Project Committee (1968); and Zeitler (1974).

Ethic references include: Brennan (1970); Conservation Education Association (1970); Editor (1970b); and Hawkins & Vinton (1973).

Integrated references include: ECOS Training Institute (1974);

Editor (1970b); Griffith, Landin, & Jostad (1971); Morrissett (1975); and Winn (1970).

Interdisciplinary references include: Bogan (1973); Editor (1970b); McGowan & Kreibel (1975); and Winn (1970).

Interrelationship references include: Aldrich & Blackburn (1975); Bogan (1973); Concepcion-Medel (1974); Department of Health, Education, and Welfare (n.d.); ECOS Training Institute (1974); Griffith, Landin, & Jostad (1971); Horn (1970); Northern Illinois University-in Brennan (1973).

Knowledge/Knowledgeable references include: Concepcion-Medel (1974); ECOS Training Institute (1974); Hernbrode (1975); Horn (1970); Stapp, et al. (1969); and Zeitler (1974).

Man-environment relationship references include: Aldrich & Blackburn (1975); Bogan (1974); Brennan (1970); Concepcion-Medel (1974); Dana (1969); Department of Health, Education, and Welfare (n.d.); ECOS Training Institute (1974); Editor (1970b); Educational Products Information Exchange (1971); Environmental Education Act of 1970; Griffith, Landin, & Jostad (1971); Hawkins & Vinton (1973); Hernbrode (1975); Hill & White (1969); Horn (1970); Hungerford & Litherland (1975); Morrissett (1975); National Park Foundation (1973); Northern Illinois University-in Brennan (1973); Roth (1970a); Smith (1970); Southern (1969); Stapp, et al. (1969); Swan (1969); Tanner (1974b); Ulrich (1974); Wang (1970); Welsh Project Committee (1968); Winn (1970); and Zeitler (1974).

Multidisciplinary references include: ECOS Training Institute (1974); Hawkins & Vinton (1973); and McGowan & Kreibel (1975).

Natural environment/Natural resources references include: Aldrich

& Blackburn (1975); Concepcion-Medel (1974); Dana (1969); Educational Products Information Exchange (1971); Environmental Education Act of 1970; Griffith, Landin, & Jostad (1971); Hawkins & Vinton (1973); Hill & White (1969); Morrissett (1974); and Welsh Project Committee (1968).

Participation references include: Dana (1969); Smith (1970); Stapp, et al. (1969); and Winn (1970).

Problems references include: Aldrich & Blackburn (1975); Bogan (1973); Concepcion-Medel (1974); Dana (1969); ECOS Training Institute (1974); Hawkins & Vinton (1973); Hernbrode (1975); Hill & White (1969); Hungerford & Litherland (1975); McGowan & Kreibel (1975); Morrissett (1975); Smith (1970); Stapp, et al. (1969); Ulrich (1974); Winn (1970); and Zeitler (1974).

Problem-solving references include: Bogan (1973); Concepcion-Medel (1974); ECOS Training Institute (1974); McGowan & Kreibel (1975); Morrissett (1974); Smith (1970); and Zeitler (1974).

Process references include: Bogan (1973); Brennan (1973); Concepcion-Medel (1974); Conservation Education Association (1970); Department of Health, Education, and Welfare (n.d.); ECOS Training Institute (1974); Griffith, Landin, & Jostad (1971); Hernbrode (1975); Horn (1970); McGowan & Kreibel (1975); and Ulrich (1974).

Quality of environment references include: Horn (1970); Northern Illinois University-in Brennan (1973); and Zeitler (1974).

Quality of life references include: Aldrich & Blackburn (1975); Brennan (1970); Department of Health, Education, and Welfare (n.d.); Editor (1969); Griffith, Landin, & Jostad (1971); and Horn (1970).

Skills references include: Aldrich & Blackburn (1975); Bogan (1973); Concepcion-Medel (1974); Hernbrode (1975); National Park

Foundation (1973); Northern Illinois University-in Brennan (1973); Welsh Project Committee (1968).

Solution references include: Aldrich & Blackburn (1975); Bogan (1973); Dana (1969); ECOS Training Institute (1974); Editor (1970b); Hernbrode (1975); McGowan & Kreibel (1975); Smith (1970); Stapp, et al. (1969); Ulrich (1974); Wang (1970); and Winn (1970).

Understanding references include: Aldrich & Blackburn (1975); Bogan (1973); Brennan (1970); Conservation Education Association (1970); Dana (1969); Department of Health, Education, and Welfare (n.d.); ECOS Training Institute (1974); Griffith, Landin, & Jostad (1971); Hawkins & Vinton (1973); Horn (1970); McGowan & Kreibel (1975); National Park Foundation (1973).

Values references include: Bogan (1973); Brennan (1973); Concepcion-Medel (1974); Department of Health, Education, and Welfare (n.d..); Hawkins & Vinton (1973); Horn (1970); Hungerford & Litherland (1975); and Morrissett (1975).

A Mediating Definition of Environmental Education

A mediating definition of environmental education was constructed utilizing primarily key words and phrases identified in Table I, or their synonyms. The definition follows:

> Environmental education--an interdisciplinary, integrated process concerned with resolution of values conflicts related to the man-environment relationship through development of a citizenry with awareness and understanding of the environment, both natural and man-altered. Further, this citizenry will be able and willing to apply enquiry skills, and implement decision-making, problem-solving, and action strategies toward achieving/maintaining a homeostasis between quality of life and quality of environment.

TABLE I

SUMMARY OF REFERENCES TO KEY WORDS AND PHRASES IN THE DEFINITIONS OF ENVIRONMENTAL EDUCATION

Approximate number of times the reference was cited	Key word or phrase
30	Man-environment relationship
17	Environment
16	Problems/Issues
12	Solution
12	Understanding
11	Process
10	Natural environment/Natural resources
9	Awareness
9	Action/Activity
8	Interrelationship
8	Attitude
8	Citizen/Citizenry
8	Concern/Concerning
8	Values
7	Problem-solving
7	Decision-making/Decisions
7	Skills
6	Knowledge/Knowledgeable
6	Quality of life
5	Integrated
4	Ethic
4	Interdisciplinary
4	Participation
4	Biosphere
3	Quality of environment
3	Multidisciplinary

The construction of this mediating definition completes research question #3. The remainder of Chapter III and Chapter IV deal with research question #4.

Part 2: Substantive Structure of Environmental Education

The data collected in Chapter II, in the section on approaches to identifying and delineating the substantive structure of environmental education, is analyzed and synthesized in this section of Chapter III. Since the research questions relate directly to the substantive structure of environmental education, they are considered before procedures are specified for dealing with the data.

Research Questions Related to the Substantive Structure of Environmental Education

Research question "1b" asked, "Based on a search of the literature, and other sources, what are the professional perceptions relative to the following: (b) substantive structure of environmental education?"

The material cited and quoted in the five sections of Chapter II related to approaches (i.e., position papers, paradigms, concept lists/ curricula, course(s), and supplemental/other) provide an answer to that question.

Research question "2b" asked, "Based on an analysis of the data from the literature, and other sources, is it possible to identify the following: (b) a generally accepted substantive structure of environmental education?"

The answer is no, there is no generally accepted substantive structure of environmental education which could be identified in the literature. Further, it seems unlikely that such a generally accepted substantive structure is available and not identified in this search, due to its extensive nature.

A recent publication of the Office of Environmental Education (n.d.) in a section entitled "Future Needs," suggests that a primary need in environmental education is "development and/or refinement of conceptual and content frameworks."

The researcher infers from this statement, and other material of a similar nature, that if a generally accepted substantive structure of environmental education is extant, the Office of Environmental Education in the U. S. Office of Education is unaware of it. That is not to imply that there is no agreement relative to some of the components or categories of components which could logically be part of a substantive structure. On the contrary, many of the works quoted and cited earlier in Chapter II reveal apparent consistencies which could form the basis of a synthesis.

Research question #4 asked

> If, in fact, there is no agreement relative to a substantive structure for environmental education, what logical, philosophical constraints can be placed on this field that would permit the formulation of a reasonable, educationally sound substantive structure for environmental education?

Since a generally agreed upon substantive structure was not identified, after an extensive search of the literature, a substantive structure was constructed by the researcher.

Since substantive structure was defined as the parts of an area of study and the arrangement/interaction of the parts, the first task in the delineation of substantive structure was a synthesis of the data to determine the parts and interrelationship extant in the literature. The specific procedures for this analysis and synthesis follow.

Procedures for Analyzing and Synthesizing the Substantive Structure of Environmental Education Identified in the Literature

In the analysis and synthesis of the data related to the substantive structure of environmental education, the researcher had the following objectives:

(1) Identify key words and phrases which occur in the substantive structures of environmental education.

(2) Determine the relative number of times these key words and phrases occur in the substantive structures of environmental education.

Procedures employed to reach the objectives stated above are listed below:

Step number one. All articles, conjunctions, and prepositions were eliminated from consideration as key words and phrases.

Rationale for step one. As connectors and modifiers, such parts of speech do not generally carry the major meaning of a sentence.

Step number two. The remaining words (e.g., nouns, verbs, adjectives, and adverbs) were examined by the researcher toward identification of key words and phrases as determined by their perceived validity as environmentally and/or educationally significant. Where appropriate, the key words and phrases were tallied in the following manner:

(1) Key words and phrases were identified primarily through reference to the following:

(a) Archbald and Gundlach's (1970) list of 44 key concepts distilled from Roth's (1970) list of 111 environmental management concept statements. The rationale for this reference is to identify cognitive knowledge key words and phrases.

(b) Bloom's (1956) work on educational objectives for the cognitive domain. The rationale for this reference is to identify cognitive knowledge and cognitive process key words and phrases.

(c) Harrow's (1972) work on the educational objectives for the psychomotor domain. The rationale for this reference is to identify psychomotor key words and phrases.

(d) Krathwohl's (1964) work on educational objectives for the affective domain. The rationale for this reference is to identify affective key words and phrases.

(e) Key words and phrases identified in the definitions of environmental education. The rationale for this reference is to identify key words and phrases which authorities in the field have used in a description of definition of environmental education.

(f) Other words and phrases identified as related to education or environment. The rationale for this entry is to identify educational and environmental key words and phrases not contained in the other lists.

(2) As the researcher read the data, a key word or phrase was identified using the references described above.

(3) The researcher wrote the key word or phrase on a separate sheet of paper and noted the author and date of publication of the reference where the key word is found.

(4) The researcher continued reading the data, identifying additional key words and phrases, and noting the author and data of publication where said key word or phrase is found.

(5) The researcher repeated (1), (2), (3), and (4) with each subsequent datum (e.g., report of a course).

(6) Subsequent references to key words and phrases, which were already part of the running list of key words and phrases, were noted by adding the name and publication date of the specific datum where the additional reference occurs.

(7) Synonyms which, by context, clearly imply a key word or phrase were noted as if the actual key word or phrase had been used.

Rationale for step two. The researcher's seven years of active involvement in environmental education has included extensive reading of the professional literature where certain words and phrases are used repeatedly by authors in the field. These terms are part of the researcher's environmental education vocabulary. Therefore, the researcher is, in effect, using his familiarity with professional terminology, in conjunction with the cited references, as criteria for selecting key words and phrases from the literature cited.

Further, the nouns, verbs, adjectives, and adverbs are the words and phrases which carry the meaning of the data; therefore, the use of a key word or phrase tends to indicate that the word or phrase is considered to be part of environmental education, at least in the perspective of the original author. Additional references to a word or phrase adds weight to the contention that the word or phrase is important to delineating environmental education's substantive structure.

Step number three. In order to determine the relative number of times each key word or phrase is used in the cited literature, the researcher counted the references to each key word or phrase on the running list and constructed Table II. In the left column Table II specifies the approximate number of times the key word or phrase is cited, and the words and phrases are listed opposite that number.

Rationale for step three. Following the logic established in the rationale for step number two, the key words and phrases which are cited relatively more times will tend to be more pervasive in the substantive structure of environmental education.

At this point it appears cogent to identify one of the limitations imposed by the researcher regarding the key words and phrases used in the data related to the substantive structure of environmental education. The key words and phrases are simply that, words and phrases. Each person cited may have used the word or phrase differently from every other person who used the same word or phrase. No attempt is made to operationalize the key words and phrases, nor to specify that the key word or phrase should be used or interpreted in a particular way. The method used is simply to establish consensus on the use of key words and phrases to provide a foundation for subsequent development of a substantive structure of environmental education.

Procedurally, in the pages that follow, the key word or phrase is underlined and the individuals who used the key word or phrase in their datum related to the substantive structure of environmental education, is cited with it by name and date of publication. The key words and phrases are listed alphabetically, as are the names of individuals cited for each

TABLE II

SUMMARY OF REFERENCES TO KEY WORDS AND PHRASES IN THE APPROACHES TO SUBSTANTIVE STRUCTURE LITERATURE

Approximate number of times the reference was cited	Key word or phrase
94	Man-environment relationship
36	Ecology
34	Integrated into curriculum
28	Values/Values clarification
26	Natural resources/Conservation
25	Technology/Science
22	Problem-solving
20	Population
19	Decision-making
18	Spaceship Earth philosophy
17	Environmental literacy
17	Interdisciplinary
14	Man-made environments
14	Environmental problems/Issues
14	Ethics
14	Socio-cultural
12	Action
12	Water
11	Wildlife
11	Social studies
11	All ages and levels
10	Pollution
10	Environmental management
9	Awareness
9	Land/Land use
9	Energy/Energy production
8	Soil
7	Human resources
7	Plants
6	Responsibility
6	Multidisciplinary
6	Politics
6	Issue investigation
6	Concern
6	Attitudes
5	Lifeboat concept
5	Action projects
5	Air
5	Forest
5	Minerals

key word or phrase.

Key Words and Phrases

Action references include: Ayres (1972); Brennan (1970); Hamann (1972); Hare (1970); Hawkins (1975); Hill & White (1969); Hungerford & Peyton (1976); Mayer & McKenzie (1974); Naylon (1970); Sehgal (1970); VandeVisse & Stapp (1975); Sharron (1972).

Action projects references include: Belgrade Charter (1976); Cummings (1973); Hare (1970); McKenna (1971); Roberts & Dyrli (1971).

Air references include: Branson (1971); Corrado (1970); National Association for Environmental Education (1973b); Ronfeldt (1969); Warpinski (1973).

All ages and levels references include: Belgrade Charter (1976); Cummings (1973); DuShane (1974); Hill (1970); Jackson (1970); Jeske (1970); Roberts & Dyrli (1971); Roth (1971); Stapp (1965); Swan (1969); Tanner (1974a).

Attitudes references include: Ayres (1972); Bowman (1972); Concepcion-Medel (1974); Jeske (1970); Knapp (1972); Ross (1970).

Awareness references include: Boyer (1974); Hamann (1972); Hill & White (1969); McInnis (1975b); Rillo (1974); Roberts & Dyrli (1971); Sparks (1974); Swan (1969); Watkins (1975).

Chemicals/nuclear/pesticides references include: Branson (1971); Howell & Warmbrod (1974); National Association for Environmental Education (1973b); Sharron (1972).

Concern references include: Concepcion-Medel (1974); Hamann (1972); C. Roth (1971); Stapp (1971); Swan (1969); VandeVisse & Stapp (1975).

Decision-making references include: Ambry (1975); Baldwin, et al.

(1975); Balzer (1970); Bowman (1972); Cummings (1974); Engleson (1975); Hawkins (1970); Hungerford & Peyton (1976); Matthews (1976); McInnis (1975b); National Association for Environmental Education (1973a); Naylon (1970); Rentsch (1973); Ross (1970); Stapp (1974, 1975); Stapp & Cox (1974); Sweeney (1974); VandeVisse & Stapp (1975).

Ecology references include: Archbald & McInnis (1975); Ayres (1972); Balzer (1970); Branson (1972); Bennett (1975); Bowman (1972); Brennan (1969); Brunckhorst (1971); Christie & Newman (1973); Concepcion-Medel (1974); Corrado (1970); Craig (1958); Editor (1970); Hamann (1972); Hanselman (1963); Isabell (1972); Jeske (1970); Kupchella & Levy (1975); Morgan, Moran, & Wiersma (1973); National Association for Environmental Education (1972); National Park Foundation (1972); Podewell (1975); Ralston & Martin (1970); Rentsch (1973); C. Roth (1971); R. Roth (1970a, 1971, 1973); Sharron (1972); Southern (1967); Stapp (1974, 1975); Stapp & Cox (1974); Troost & Gottlieb (1972); VandeVisse & Stapp (1975); Warpinski (1973).

Energy/energy production references include: Archbald & McInnis (1975); Balzer (1970); Bennett (1975); Bogan (1973); Brandwein (1971); Hamann (1972); National Association for Environmental Education (1973b); Podewell (1975); Sehgal (1970).

Environmental literacy references include: Balzer (1970); Brennan (1970); Caldwell (1970); Christie & Newman (1973); Concepcion-Medel (1974); Editor (1970a); Hamann (1972); Hungerford & Peyton (1976); Lamb (1975); Linsky (1971); Loret (1974); Nash (1974); Naylon (1970); Nixon (1970); Rillo (1974); Roberts & Dyrli (1971); C. Roth (1971).

Environmental management references include: Balzer (1970); Bogan (1973); Bowman (1972); Brandwein (1971); Fox (1970); Morrissett (1975);

Roth (1970a, 1971); Sehgal (1970); Warpinski (1973).

Environmental problems/issues references include: Ambry (1975); Balzer (1970); Christie & Newman (1973); Isabell (1972); Knapp (1975); McKenna (1971); Morrissett (1975); National Association for Environmental Education (1973a, 1973b); Naylon (1970); Roth (1970a, 1971); Sehgal (1970); Troost & Gottlieb (1972).

Ethics references include: Boyer (1974); Brennan (1970); Bryson (1970); Cummings (1973); Editor (1970a); Hawkins (1970); Lamb (1971); Linsky (1971); National Association for Environmental Education (1973b); Rentsch (1973); Stapp (1974, 1975); Stapp & Cox (1974); VandeVisse & Stapp (1975).

Forest references include: Brown & Mouser (1965); Bruker (1972); Hanselman (1963); Strader (1965); Visher (1959).

Human resources references include: Bennett (1975); Hanselman (1963); Rentsch (1973); Roth (1970a); Strader (1965); Visher (1959); Wang (1970).

Integrated into curriculum references include: Aldrich & Blackburn (1975); Altman (1972); Ayres (1972); Brandwein (1966); Bryson (1970); Capps (1941 in Callison, 1953); Cauley & Groves (1974); Concepcion-Medel (1974); Department of Health, Education, and Welfare (n.d.); ECOS Training Institute (1974); Editor (1970); Geer (1958); Harrah & Harrah (1975); Hawkins (1970, 1975); Jackson (1970); Jeske (1970); Keach (1973); NSTA (1970); Peterson & Hall (1974); Rillo (1974); Ronfeldt (1969); Schafer & Disinger (1975); Schultz (1975); Stapp (1964, 1965, 1971, 1974a, 1975); Stapp & Cox (1974); Tanner (1974a, 1974b); VandeVisse & Stapp (1975); Whitfield (1971).

Interdisciplinary references include: Ambry (1975); Altman (1972);

Belgrade Charter (1976); Cummings (1973); Hafner (1970); Hare (1970); Hawkins (1975); Jeske (1970); Jinks (1974); Mayer & McKenzie (1974); McKenna (1971); Peterson & Hall (1974); C. Roth (1971); R. Roth (1971); Stapp (1971); Voelker & Kolb (1973); Wang (1970).

Issue investigation references include: Ambry (1975); Balzer (1970); Knapp (1975); Stapp (1975); Tanner (1974a); Watkins (1975).

Land/land use references include: Bogan (1973); Branson (1971); Corrado (1971); Hanselman (1963); National Association for Environmental Education (1973b); Naylon (1970); Ronfeldt (1969); Sehgal (1970); Warpinski (1973).

Lifeboat concept references include: Hardin (1968, 1972a, 1972b, 1974); Hungerford & Peyton (1976).

Man-environment relationship references include: Ambry (1975); Archbald & McInnis (1975); Balzer (1970); Belgrade Charter (1975); Bennett (1975); Bogan (1973); Bowman (1972); Boyer (1974); Brandwein (1971); Branson (1972); Brannan (1969, 1970); Bruker (1970); Brunckhorst (1971); Bryson (1970); Burton, Kates, & Kirkby (1974); Caldwell (1970); Christie & Newman (1973); Clark (1969); Concepcion-Medel (1974); Corrado (1970); Cummings (1973, 1974); DuShane (1974); Editor (1970); Engleson (1975); Fox (1970); Gargasz (1973); Hafner (1970); Hamann (1972); Hanselman (1963); Hare (1970); Hart & Turner (1974); Hawkins (1970, 1975); Hill & White (1969); Howell & Warmbrod (1974); Isabell (1972); Jeske (1970); Jinks (1974); Klausner (1972); Knapp (1975); Kupchella & Levy (1975); Lamb (1975); Linsky (1971); Matthews (1976); Mayer & McKenzie (1974); McInnis (1975b); McKenna (1971); Morgan, Moran, & Wiersma (1973); Morrissett (1975); Nash (1974); National Association for Environmental Education (1973a, 1973b); National Park Foundation (1972);

Naylon (1970); Peterson (1972); Podewell (1975); Ralson & Martin (1970); Rentsch (1973); Rillo (1974); Roberts & Dyrli (1971); Ronfeldt (1969); C. Roth (1971); Roth (1970a, 1971, 1972, 1973); Schoenfeld (1970); Sears (1972); Sehgal (1970); Sharron (1972); Southern (1967); Sparks (1974); Stapp (1969, 1970, 1971, 1974a, 1975); Stapp & Cox (1974); Stegner (1971); Swan (1969); Swanson (1975); Sweeney (1974); Tanner (1974a, 1974b); Troost & Gottlieb (1972); VandeVisse & Stapp (1975); Visher (1959); Voelker & Kolb (1973); Walkosz (1972); Warpinski (1973); Watkins (1975); Yambert (1960).

Man-made environments references include: Boyer (1974); Brandwein (1971); Christie & Newman (1973); Concepcion-Medel (1974); Corrado (1970); Engleson (1975); Hare (1970); Jeske (1970); McInnis (1975b); Morrissett (1975); National Association for Environmental Education (1973a); Ronfeldt (1969); Stapp (1969); Wang (1970).

Minerals references include: Dambach & Finlay (1961); Hanselman (1963); Howell & Warmbrod (1974); Jeske (1970); Visher (1959).

Multidisciplinary references include: Ayres (1972); Concepcion-Medel (1974); DuShane (1974); Nash (1974); Roberts & Dyrli (1971); Tanner (1974b).

Natural resources/Conservation references include: Balzer (1970); Bennett (1973); Bogan (1973); Brandwein (1971); Brennan (1971); Bruker (1972); Christie & Newman (1973); Dambach & Finlay (1961); Engleson (1975); Fox (1970); Geer (1958); Hanselman (1963); National Association for Environmental Education (1973a, 1973b); Naylon (1970); Ross (1970); Roth (1970a, 1971, 1972); Sehgal (1970); Southern (1967); Stapp (1969); Visher (1959); Wang (1970); Warpinski (1973); Yambert (1960).

Plants references include: Branson (1971); Dambach & Finlay (1961);

Fox (1970); Hanselman (1963); Jeske (1970); Visher (1959); Walkosz (1972).

Politics references include: Branson (1971); Hanselman (1973); National Association for Environmental Education (1973b); C. Roth (1971); R. Roth (1970a); Troost & Gottlieb (1972).

Pollution references include: Bogan (1973); Branson (1971); Bruker (1972); Jeske (1970: Morrissett (1975); Rentsch (1973); Sehgal (1970); Sharron (1972); Sweeney (1974); VandeVisse & Stapp (1975).

Population references include: Balzer (1970); Bogan (1973); Branson (1971); Bruker (1972); Cochran & McCrea (1974); Fox (1970); Hamann (1972); Jeske (1970); Morrissett (1975); National Association for Environmental Education (1973a, 1973b); Rentsch (1973); Sehgal (1970); Sharron (1972); Southern (1967); Stapp (1975); Stapp & Cox (1974); Stegner (1971); Sweeney (1974); VandeVisse & Stapp (1975).

Problem-solving references include: Baldwin, et al. (1975); Balzer (1970); Berger (1956); Concepcion-Medel (1974); Cummings (1974); Hart & Turner (1974); Hill & White (1969); Hungerford & Peyton (1976); Lamb (1971); McKenna (1971); Nash (1974); Naylon (1970); C. Roth (1971); Stapp (1971, 1974); Stapp & Cox (1974); Stapp, et al. (1969); Sweeney (1974); VandeVisse & Stapp (1975); Tanner (1974b); Walkosz (1972); Zeitler (1974).

Responsibility references include: Boyer (1974); Clark (1969); Linsky (1971); National Association for Environmental Education (1973a). Southern (1967); Warpinski (1973).

Social studies references include: Altman (1972); Ambry (1975); Brandwein (1971); Hare (1970); Hardy (1973); Jinks (1974); Peterson & Hall (1974); C. Roth (1971); R. Roth (1971); Voelker & Kolb (1973); Walkosz (1972).

Socio-cultural references include: Ambry (1975); Balzer (1970); Bennett (1975); Bowman (1972); Brandwein (1971); Bryson (1970); Hanselman (1963); National Association for Environmental Education (1973b); Roth (1970a, 1971, 1972, 1973); Sehgal (1970); Warpinski (1973).

Soil references include: Brown & Mouser (1965); Bruker (1972); Dambach & Finlay (1961); Hanselman (1963); Jeske (1970); National Association for Environmental Education (1973b); Strader (1965); Visher (1959).

Spaceship Earth philosophy references include: Bates (1969); Committee on Resources and Man (1969); Commoner (1971); Cummings (1973, 1974); Fuller (1969); Hardin (1968, 1972a, 1972b, 1974); Hawkins (1975); National Association for Environmental Education (1973a); Pavoni, Hagerty, & Peer (1974); Rentsch (1973); Stapp & Cox (1974); Stevenson-in Hardin (1972a); VandeVisse & Stapp (1975); Ward (1966).

Technology/science references include: Altman (1972); Ambry (1975); Balzer (1970); Bennett (1975); Bogan (1973); Bowman (1972); Brandwein (1971); Bryson (1970); Christie & Newman (1973); Cummings (1974); Fox (1970); Geer (1958); Hamann (1972); Isabell (1972); Jinks (1974); National Association for Environmental Education (1973b); Podewell (1975); Rentsch (1973); Sehgal (1970); Stapp (1974, 1975); Stapp & Cox (1974); Swan (1969); Troost & Gottlieb (1972); Wang (1970).

Values/values clarification references include: Ambry (1972); Archbald & McInnis (1975); Ayres (1975); Bowman (1972); Brandwein (1971); Brunckhorst (1971); Caldwell (1970); Christie & Newman (1973); Concepcion-Medel (1974); Cummings (1973, 1974); Engleson (1975); Geer (1958); Hamann (1972); Jeske (1970); Jinks (1974); Lamb (1975); McInnis (1975b); Naylon (1970); Roberts & Dyrli (1971); Stapp (1971, 1974); Stapp

& Cox (1974); Swanson (1975); Sweeney (1974); Tanner (1974a); Troost & Gottlieb (1972); Voelker & Kolb (1973).

Water references include: Bogan (1973); Branson (1971); Brown & Mouser (1965); Bruker (1972); Corrado (1970); Dambach & Finlay (1961); Hanselman (1963); National Association for Environmental Education (1973b); Ronfeldt (1969); Strader (1965); Visher (1959); Warpinski (1973).

Wildlife references include: Brown & Mouser (1965); Bruker (1972); Dambach & Finlay (1961); Fox (1970); Hanselman (1963); Howell & Warmbrod (1974); Jeske (1970); National Association for Environmental Education (1973b); Strader (1965); Visher (1959); Walkosz (1972).

Chapter IV

DELINEATION OF SUBSTANTIVE STRUCTURE OF ENVIRONMENTAL EDUCATION

Research question #4, asked in Chapter I, is reiterated at this point:

> If, in fact, there is no agreement relative to a substantive structure for environmental education, what logical, philosophical constraints can be placed on this field that would permit the formulation of a reasonable, educationally sound substantive structure for environmental education?

In Chapter IV, the researcher constructs a substantive structure which, he perceives, meets the criteria established in the research question.

In Chapter I of this study, substantive structure was defined as "the parts of an area of study and the arrangement/interaction of those parts." Certainly, there are many ways of constructing a substantive structure for environmental education given the amount of data available in the first three chapters. The researcher has selected an approach which he perceives meets the established criteria, and also produces a generic substantive structure with a broad scope.

The approach selected by the researcher is to concentrate on those major components of substantive structure which influence all other parts and relationships, i.e., the components which are most pervasive and most dominating. Specifically, the researcher will deal with three components of the substantive structure of environmental education in this chapter: philosophy, precept, and expected outcome. Additional related components will be discussed as appropriate to fully delineate the substantive structure of environmental education.

These three components (philosophy, precept, and expected outcome) constitute the general or generic substantive structure of environmental education. Further, they, individually and collectively, mandate the specifics of environmental education. In other words, in order to be considered part of environmental education, specific activities, strategies, units, courses, etc., must conform to the guidelines established in the delineation of a generic substantive structure of environmental education. Referring again to the definition of substantive structure, these three components (philosophy, precept, and expected outcome) are the parts of environmental education. They mandate the specific parts and the arrangement/interaction of those specific parts, which are, in effect, the curriculum and instruction of environmental education.

Each of the three basic components of the substantive structure of environmental education (philosophy, precept, and expected outcome) will be handled in a separate section of Chapter IV. Although each will be handled separately, the interrelationships among the components will be made clear.

Philosophy Underlying Environmental Education

Philosophy is the first major component of the substantive structure of environmental education. As with any other area of study, the philosophical base is considered to be critical in determining the general and specific characteristics of substantive structure.

Two terms used in the environmental education literature to describe philosophical positions in environmental education are "Spaceship Earth" and "lifeboat." Each of these positions will be examined in the discussion of a philosophical base for the substantive structure of environmental education.

"Spaceship Earth" Philosophy

One of the prominent philosophical positions found in the professional environmental education literature is referred to as the "Spaceship Earth" philosophy. A number of authors who have referred to this philosophy and its implications are cited in Chapter II and summarized in Chapter III.

The spaceship analogy is very clear. A spaceship, such as the capsule which carried astronauts to the moon and back, is self-contained. That is to say, all the food, water, air fuel, and other resources are carried with the spaceship. The crew-members are well-trained, knowledgeable in the operation of the spaceship, and they effectively interact with the spaceship's systems. The systems of the spaceship maintain the air, water, and other recyclable resources, but the crew-members must be certain the systems are not impeded in their operation.

Although some resources may be reused during the journey, the ability of the spaceship's systems to recycle them is critical to the survival of the crew-members. Some resources are non-renewable or not recyclable. An example of one such resource is fuel carried on the journey. When the fuel, or other non-renewable resource is used up, the crew-members must do without it. In some cases, a critical non-renewable resource, which is no longer available, may be substituted for, thereby allowing for the continued survival of the crew.

Processes and situations of the small space capsule, described in the preceding paragraphs, are equally true of "Spaceship Earth." The spaceship, i.e., the earth, is carrying the crew, i.e., the inhabitants of planet earth, on a journey through the universe. In other words, there is a relationship between the ship and crew on "Spaceship Earth" just as there is between ship and crew on a small space capsule. This is the man-earth relationship, or stated another, more generic way, the man-environment relationship.

Clearly, the crew-members in a capsule traveling from the earth to the moon cannot foul the air with deadly chemicals, nor the water with sewage and expect the ship's systems to cleanse these resources again without proper and continual maintenance of the support systems. The same situation exists on "Spaceship Earth."

The "Spaceship Earth" analogy, then, suggests that the earth is self-contained, has some systems which recycle some resources, that some resources are non-renewable, and that the inhabitants are dependent on and responsible for the maintenance of earth's systems. In other words, except for the sun, the earth is essentially a closed system.

Lifeboat Concept

The "lifeboat" concept is similar to the "Spaceship Earth" philosophy in its basic elements. That is, the earth is self-contained; it has systems that recycle some resources; some resources are non-renewable; and, the inhabitants are dependent on and responsible for the maintenance of the systems. In fact, Hardin (1972), the principal architect of the "lifeboat" concept states, "Earth is a Spaceship" (Emphasis in original). The "lifeboat" concept, though, considers additional factors not generally included in discussions of the "Spaceship Earth" philosophy per se.

The major additional factor of the "lifeboat" concept is human population growth and the implications of this unrestricted growth on the limited amount of resources available on this finite planet. The specific point is made that the optimum population is undetermined, but less than the maximum population. Further, there is no choice but to limit population growth in some manner. This is clearly a value laden component, as are the related factors in the "lifeboat" concept.

Related to the question of population size is distribution of that population, and more particularly, immigration policies. A third, also related factor, is the use of the commons, or that which is available for all to use. The commons tends to be less protected than resources where ownership is established. The deterioration of the commons is potential disaster for all the passengers in all the "lifeboats."

A major concept of the "lifeboat" frame of reference is the limited capacity of each "lifeboat." Each nation is conceptualized as a "lifeboat" with limited resources and space. This logically leads to a question of ethics related to the population question mentioned earlier. Hardin (1974) offers the graphic example of a lifeboat with 50 people in it with a capacity of 60, i.e., a safety margin of ten. If the 50 people in the lifeboat see 100 people swimming in the water, Hardin proposes there are three options open, namely, (1) take in swimmers until the "lifeboat" is overloaded and sinks, (2) allow ten aboard (but which ten?), and (3) admit no more to the "lifeboat."

Hardin offers the suggestion that anyone who feels guilty about leaving the 100 people in the water has the option of giving up his place to one of those people. Clearly, the "lifeboat" concept is one which is deeply values oriented, with very clear ethical options related to the resources of the planet called "Spaceship Earth."

Implications of the "Spaceship Earth/ Lifeboat" Philosophy

The "Spaceship Earth" philosophy deals with what is perceived to be a desirable homeostatic relationship between the earth and its inhabitants. The "lifeboat" concept takes this general premise and focuses on several points, but particularly on human population growth and its implication, i.e., it applies human values to the man-environment relationship. The researcher, then, takes the position that the "Spaceship Earth" philosophy and the "lifeboat" concept are complementary.

The difficulty in interpretation, as is often the case, is with the words used to name each of the positions. The researcher offers no "new" names for either position. Whether or not a new name is developed which indicates their perceived relationship, the researcher's position is that the "Spaceship Earth" philosophy and "lifeboat" concept are, taken together, a basic premise for what is called environmental education. Specifically, the "lifeboat" concept is perceived to be a particular frame of reference within the "Spaceship Earth" philosophy.

It seems clear that a critical element in the philosophical position is the relationship between the earth and its human inhabitants. These three elements (man, earth, and the relationship between them), then, form the precept, or prime directive for environmental education. This precept is the first of two criteria of environmental education which operationalize the philosophical position. The term used, or implied, in the environmental education literature to describe this relationship is "man-environment relationship."

A second critical element of the philosophical position, and the second criterion for operationalizing the philosophical position, is the application of human values to the man-environment relationship. The "lifeboat" concept, in effect, adds to the values or axiological component of the "Spaceship Earth" philosophy which is otherwise less complete.

Finally, the point is reemphasized that the philosophical position ("Spaceship Earth" with a focus on the "lifeboat" concept) is the first of three major components of the generic substantive structure of environmental education. The second major component, precept (man-environment relationship) will be considered in the next section.

Philosophy--"Spaceship Earth" with a "lifeboat" frame of reference

Figure 50. The philosophy of the substantive structure of environmental education.

Precept

Precept is defined as "a commandment or direction given as a rule of action or conduct," (Random House, 1969). A precept, then, is the direction, the driving force that mandates all other aspects of a given situation. In this case, the precept (man-environment relationship) mandates all other aspects of the entity "environmental education."

The precept, then, as the second major component of the substantive structure of environmental education, in consort with the values context, operationalizes the philosophy and determines the rest of the substantive structure of environmental education, both generic and specific. Only the generic components of substantive structure are considered in this study. In the discussion of those components, "topic" will be used in a particular way.

For the purposes of this study, the term "topic" will be operationally defined, as follows:

> Topic--a general field of consideration, including but not limited to, courses and other curricular involvements, instructional strategies and processes, and other related experiences and situations.

Precept--The man-environment relationship

Figure 51. The precept of the substantive structure of environmental education.

The Man-Environment Relationship

The characteristic most often mentioned or implied by authors writing in the field of environmental education dealt with the man-environment relationship. Further, many authors stated or implied that the interaction of humans with the biophysical environment is the most basic principle, i.e., the precept, of environmental education. The researcher perceives that the precept (man-environment relationship) is a major component of the substantive structure of environmental education.

That is to say, the precept (man-environment relationship) is a primary element that separates environmental education from other areas of study, and it correlates well with the "Spaceship Earth/lifeboat" philosophy.

What specifically is this man-environment relationship? Definitions of this relationship are almost nonexistent in the professional literature, perhaps because it appears to be a self-explanatory term. Nevertheless, the researcher perceives a need for operationalizing the term. Therefore, the researcher's operational definition follows:

> Man-environment relationship (MER)--the consideration of, planning for, and implementation of natural resources use by human beings; the resultant products and processes; and implications for future impact on the environment reflected in each person's perception of an acceptable quality of life.

There is no intent on the part of the researcher to construct a values-laden definition, i.e., this definition subsumes all man-environment relationships from outright exploitation through total preservation. Further, man, who *is* part of the environment, and a resource, is arbitrarily and artificially separated from other resources since he alone of earth's inhabitants can significantly influence "environmental quality" on a global scale. Man is, therefore, the dominant factor in many environmental relationships, but to what end?

The researcher perceives that the end result, or superordinate goal, of the man-environment relationship must be clearly defined. In this study, the researcher defines the ultimate end result in the following manner:

> Superordinate goal of the man-environment relationship--The achievement/maintenance of a homeostasis between quality of life and quality of environment.

Efforts of environmental education must be directed toward reaching this end result.

The precept (man-environment relationship) is the first criterion that the researcher established for determining what is part of environmental education. This means that in order to be considered part of environmental education, the topic (used in the broadest sense, as indicated in the introduction to this section) must deal with the man-environment relationship. If it does not deal with the man-environment relationship, then it is not part of environmental education. There is, however, more to it than that. The phrase "deal with" is open to some interpretation, therefore, the specific manner in which those topics "deal with" the man-environment relationship must be clarified.

The second criterion (i.e., the manner in which the topics "deal with" the man-environment relationship) that the researcher has established for determining what is part of environmental education is the application of human values to the precept (man-environment relationship). This is based on the values, or axiological, component of the "Spaceship Earth/lifeboat" philosophy introduced earlier in the chapter. Both of the criteria listed above are elaborated on later in the section, but an example will be offered at this point to help with the clarification.

The situation posed for the example is as follows: A highway is proposed with a route through a state forest. The issues involved in determining the route of the highway, as well as whether or not to even build the highway at all, are legitimate topics for environmental education. The reason they are legitimate topics is that they meet the criteria of (1) dealing with the man-environment relationship, and (2) dealing with the man-environment relationship in a values-laden context.

The engineering and construction of the highway, though, regardless of the decision about route, is not environmental education even though there is an obvious relationship between man and environment in the construction (i.e., it is part of the MER, as defined earlier). The key to the distinction between what is and what is not environmental education is that the man-environment relationship in the latter case (i.e., the post-decision construction), takes place in essentially a non-values-laden situation. In other words, the construction process itself leaves the realm of environmental education since the values-laden decision has been made. It is, however, possible for the engineering/construction process, or the highway itself, to become part of an issue. Technology per se is valueless, but the implementation of that technology may be values-laden.

The term used in this example, and the one most often used or implied in the literature to describe the relationship between human beings and the environment is man-environment relationship. If, in fact, this term does accurately describe the focus of the area of study called environmental education, then it is the researcher's contention that environmental education is a misnomer and should be changed to reflect more accurately its true focus.

Further, this is one of several major inconsistencies, or areas of incompleteness, which the researcher perceived in his extensive search of the environmental education literature. The researcher further contends that it is critical to resolve each of these logical inconsistencies before a philosophically and logically sound substantive structure for environmental education can be constructed.

The first major inconsistency, i.e., the name "environmental education," will be resolved in the next section. Subsequently, others will be pointed out and resolved as the researcher moves toward a complete delineation of the substantive structure of environmental education.

The Use of the Term Man-Environment[1] Relationship

As indicated previously, one of the two criteria established for determining what topics are part of the area of study called "environmental education" is the presence of a focus on the man-environment relationship. The researcher is of the opinion that based on the key role of the precept (man-environment relationship), and the discrepancy between the precept (man-environment relationship) and the current title to the area of study, i.e., "environmental education," that environmental education is a misnomer. The researcher suggests the precept (man-environment relationship) as the new title in the form "man-environment relationship education," "MER education," or simply "MERE."

It appears to the researcher that based on the conceptualization in this study, this is a more accurate designation which clarifies at least some of the confusion inherent in the term "environmental education." It moves the apparently total focus from environment to include man and the relationship between them. Sims and Baumann (1974) put it another way. "Many, perhaps most environmentalists have a patch of ignorance over one eye; they focus clearly only on the latter term of the man-environment equation."

Two terms have been introduced in this section, man-environment relationship (MER), and man-environment relationship education (MERE). The researcher perceives that there is a third, related, term that must be considered, i.e., man-environment relationship foundations (MERF). Each of these three terms will be defined and operationalized in the next subsection of this chapter.

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[1] The term "man" is used generically, in the traditional sense, to represent all human beings. This form is consistent with usage in the professional literature.

Man-Environment Relationship Education vs. Man-Environment Relationship Foundations

Introduction

The precept (man-environment relationship) is one of two criteria within the substantive structure of environmental education which the researcher has established to specify which topics are man-environment relationship education (MERE). It logically follows that what is not environmental education must be something else. Within the literature of "environmental education," which was extensively documented in Chapter II, and subsequently synthesized in Chapter III, no such distinction is perceived by the researcher.

However, it is also clear that many of the topics in the literature which are not part of "environmental education" contribute to the development of knowledge, affect, or skills which increase the ability to deal with the man-environment relationship in a values-laden context. Or, in other words, such topics provide a foundation for "environmental education."

Stated another way, topics related to man-environment relationship *education* and those related to man-environment relationship *foundations* are intermixed in the "environmental education" literature. Such a situation is confusing, at best, and probably has contributed to the previous difficulty in delineating a substantive structure of "environmental education." The researcher suggests that it is critical to recognize, identify, and operationalize this dichotomy between MER education and MER foundations. This is the second inconsistency perceived by the researcher in the "environmental education" literature.

A first step in operationalizing this dichotomy is the paradigm offered below:

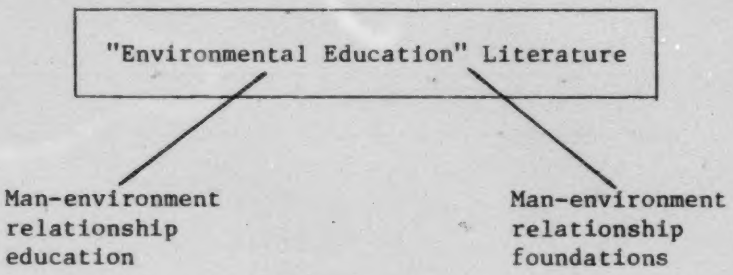
"Environmental Education" Literature
Man-environment relationship education
Man-environment relationship foundations

Figure 52. A paradigm to illustrate the dichotomy between MER education and MER foundation, which are intermixed in the "environmental education" literature.

Since the two terms man-environment relationship education (MERE) and man-environment relationship foundation (MERF) are closely related, the researcher will operationalize each through a definition and by reference again to the definition of the precept of the substantive structure of environmental education (man-environment relationship without attendant terms).

> Man-environment relationship (MER)--the consideration of, planning for, and implementation of natural resources use by human beings; the resultant products and processes; and implications for future impact on the environment reflected in each person's perception of an acceptable quality of life.

Man-environment relationship education (MERE)[2]--the process of developing an environmentally literate, competent, and dedicated citizenry which actively strives to resolve values conflicts in the man-environment relationship, in a manner which is ecologically and humanistically sound, in order to reach the superordinate goal of a homeostasis between quality of life and quality of environment.

Man-environment relationship foundations (MERF)--a topic which provides learnings (psychomotor, cognitive, or affective) about the man-environment relationship, in a non-values-laden context, which are prerequisite, or complementary, to MERE.

The full terms defined above or their letter designations will be used interchangeably in the remainder of the study, e.g., man-environment relationship, or MER. MERE and MERF will be discussed in more detail in subsequent subsections in the continuing delineation of the substantive structure of "environmental education."

MER education topics are essential components of the substantive structure of "environmental education," but MER foundation topics are not part of that substantive structure. The brief descriptions of the MER foundation topics, which follow the MERE section, are provided simply to more clearly delineate this dichotomy, and by contrast, more clearly delineate what is part of the substantive structure of "environmental education." Since MER foundations are not part of the substantive structure, no effort is made to identify a total and rational structure for MER foundation components or topics.

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[2] The definition developed from the literature in Chapter III should be substantially the same as MERE, given that the structures are similar or the same. The original definition of environmental education was constructed under the constraint of using specific key words and phrases. The researcher's position is that the definition constructed in Chapter III is sound, but that the definition of MERE constructed above more nearly matches his conceptualization of the substantive structure delineated in this study; therefore, the above definition, MERE, will be used in the remainder of the study.

Man-Environment Relationship Education (MERE)

The distinction between MER education and MER foundations is critical to the accurate and complete delineation of the substantive structure of "environmental education," as well as for the subsequent implications for curriculum and instruction which will be discussed in Chapter V. In MER education, the focus of the topic is the man-environment relationship in a values-laden context.

Specifically, the two criteria which characterize the "Spaceship Earth/lifeboat" philosophy, must characterize a topic before it is MER education (i.e., "environmental education"):

(1) All three components of the precept (man, environment and relationship) must be present.

(2) A human values component representing different positions relative to a man-environment relationship issue must be present.

For example, a course in political science could be handled as a purely MER education topic, and perhaps entitled "environmental politics." It is more likely, perhaps, that a unit, constituting less than a full course, would have a focus on the man-environment relationship in a values-laden context. In this latter instance, the unit. not the course, would be considered MERE. The essential point is, the precept (man-environment relationship) handled in a values-laden context provides the focus to make the topic part of the substantive structure of "environmental education." If it did not contain the values component, it would not be a MERE topic.

Man-Environment Relationship Foundations (MERF)

Providing foundational learnings is critical to effective MERE, but the foundations themselves are not part of the substantive structure of "environmental education." The critical distinction between MERE and MERF is between learnings dealing with the man-environment relationship in a values-laden context (MERE), as opposed to learnings which (1) deal with less than all three components of the man-environment relationship, and/or (2) deal with all three components of the man-environment relationship, but in a non-values-laden context, (i.e., MERF).

An example of a topic which is generally discussed in the "environmental education" literature as a part of "environmental education," but which is perceived to be a MER foundation, is ecology. Ecology is a science, part of the biological science area and deals with the relationships of organisms to their surroundings. Certainly, ecology is an essential foundation to MER education since ecological principles are fundamental in dealing with man's interaction with the earth, yet ecology per se does not deal with that relationship in a values-laden context.

On the other hand, specific topics within ecology may be handled in a manner to cause them to become part of MER education, e.g., issues in population dynamics, handled with respect to human populations and their impact on the earth and the resultant problems, obviously are MER education topics.

The critical element is the focus of the topic. If it has a focus on dealing with the MER in a values-laden context, the topic is MER education (i.e., "environmental education"). If it provides learnings which may contribute to effective dealing with MER, but which do not meet both criteria of MER education, the topic is foundational, i.e., part of MER foundations.

The researcher perceives three basic types of MER foundations: man-focused, environment-focused, and relationship-focused. Each will be briefly described to further clarify the delineation of the dichotomy between MERE and MERF.

Man-focused foundations. Man-focused foundations are topics which have as a main focus the human being, either individually or collectively. Specifically, the social sciences, humanities, and behavioral sciences are examples of areas of study which may provide learnings which are foundations for man-environment relationship education (MERE).

For example, topics in political science generally deal with the man-man relationship, and as such, are not part of MERE, i.e., they are not part of the substantive structure of "environmental education." Such topics do not meet either criteria of MERE specified earlier.

Yet, topics dealing with the enactment of laws, judicial review, the election process, and initiative petitions have application in man's interaction with the environment in terms of the values criterion, therefore, as such are environmental foundations. Further, addition of the other two components of precept (e.g., environment and relationship) and a human values component allow a MERF topic to become a MERE topic since both criteria established for MERE have been met.

For example, the prospect of an initiative petition, circulated to gather signatures to place a proposition on a ballot to permanently stop deer hunting in a state, is a legitimate MERE topic. It is so because it meets the criteria of (1) dealing with the man-environment relationship, and (2) dealing with the man-environment relationship in a human values context. Potentially, many would become actively involved on both sides of this issue, regardless of the ecological evidence in favor of deer hunting as an effective management practice.

The point is, it is the manner and the context in which a topic is handled, not the topic per se, which determines whether it is MERE, MERF, or neither.

Environment-focused foundations. Environment-focused foundations are topics which have as a main focus the biophysical environment and its systems. Specifically, as examples, the sciences and conservation of natural resources may provide learnings which are foundations for man-environment relationship education (MERE).

Cognition relative to the conservation of natural resources is critical in the decision-making, problem-solving processes which are part of MERE, and yet the conservation of natural resources topics per se are not necessarily part of MERE. If they are handled in a non-values-laden context, i.e., empirically, or if all components of the man-environment relationship are not included, the conservation of natural resources topics are foundational. On the other hand, the same topics handled in a values-laden context, and in connection with the other components of the precept (man-environment relationship), are part of MERE.

A brief example of moving from MERF to MERE could be a course in soil science. Such a course dealing with the physical properties of soil is foundational. That is, it deals essentially with one component of the precept and does so in a non-values-laden context. The application of those learnings to a values-laden, decision-making context, related to the "proper" use of a given piece of land by human beings, is legitimately a MERE situation.

Relationship-focused foundations. Relationship focused foundations include topics which have as their focus the relationship between humans and the earth, and the products/processes resultant from that interaction, but the topic is handled in a non-values-laden manner. For example, agricultural practices deal with, among other things, plowing the soil, planting crops, harvesting crops, and maintaining livestock, all of which have impact on the environment as well as the humans who consume the food which is produced. Certainly, many agricultural topics meet the first criterion of MERE of dealing with the precept (man-environment relationship), yet do not meet the second of doing so in a values-laden context. The practice of agriculture is essentially non-values-laden and there are no issues inherent in many of those pursuits. This does not mean, however, that all agricultural practices are values free. The point is, the topic is foundational until a formal values context (i.e., an issue) is introduced.

Agricultural practice is the major example of this foundation component, but other man-environment relationship situations including construction, resource extraction, resource processing, parks management, and wildlife management, have topics which fit the criterion of dealing with the precept (man-environment relationship). Such topics dealing with the precept (man-environment relationship) in a non-values-laden context are MERF. The same topic, handled with a values-laden component could be MERE.

Multidisciplinary or Interdisciplinary?

The term "multi" is generally interpreted to mean many (e.g., multifaceted), while "inter" is generally interpreted to mean between or among (e.g., international). These general interpretations hold for their use in connection with the man-environment relationship.

The terms are defined, by the researcher, as follows:

Multidisciplinary--components from two or more academic disciplines focused sequentially on a single topic.

Interdisciplinary--components from two or more academic disciplines focused simultaneously on a single topic.

The key element is not the number of disciplines involved, but whether they focus on a topic sequentially, i.e., the disciplines are recognizable, or simultaneously, i.e., the disciplines are not recognizable.

Within the "environmental education" literature, references are made to the interdisciplinary and/or multidisciplinary nature of "environmental education." The researcher perceives this as the third major inconsistency in the literature, and practice, which is in need of clarification. Further, the researcher contends that the discrepancy results from two causes: (1) a lack of parallel definitions of the terms multidisciplinary and interdisciplinary, and (2) the indiscriminate mixing of MERE and MERF topics in the "environmental education" literature.

There are, in fact, multidisciplinary and interdisciplinary components described in the literature; however, recognition of the definitions offered above, and of the dichotomy established between MERE and MERF topics, opens the way to a clear, consistent, accurate application of the terms. More importantly, it allows for consistent application of MERE and MERF topics in a proper context.

Specifically, the researcher perceives that MERE, by definition, must be interdisciplinary since there is a simultaneous focus on the precept (man-environment relationship) in a values-laden context. MERF, on the other hand, is generally disciplinary. However, depending on the focus of the MERF topic, it may be multidisciplinary, or even interdisciplinary. The most important point is that MERE must be interdisciplinary, by definition of MERE and of the term interdisciplinary.

The implications of this dichotomy will be among those discussed in the next subsection.

Implications of the MERE-MERF Dichotomy

1. A given topic may be MERE, MERF, or neither, depending on whether it meets the two criteria established for MERE:

    a. All components of the precept (man-environment relationship) must be present.

    b. A human values component representing different positions relative to a man-environment relationship issue must be present.

For a topic to be part of MERE, i.e., part of the substantive structure of "environmental education," it must meet both criteria.

2. The researcher is not suggesting that MER foundations have no place in the "environmental education" literature, or practice. On the contrary, MER foundations are, by definition, essential components for effective dealing with the man-environment relationship. It is critical, though, that the dichotomy be recognized and accounted for in the literature as well as in practice.

3. MER foundations are generally disciplinary, but may be multidisciplinary, or even interdisciplinary. The foundations provide learnings which are applied in an interdisciplinary manner in MER education.

4. MER education is, by definition, interdisciplinary; therefore,

the person who deals effectively with MERE must have knowledge in various areas, and should be able to operate at the upper levels of the psychomotor, cognitive and affective domains.

Expected Outcome

Introduction

The philosophical position ("Spaceship Earth/lifeboat"), and the precept (man-environment relationship) handled in a values context, are the first two major components of the substantive structure of "environmental education." At this point, the researcher's next logical step in the delineation of the substantive structure of "environmental education" is to consider the expected outcomes which are the logical outgrowth of the philosophical position and its operation through the precept in a values context. Expected outcome, then, constitutes the third, and final, major component in the delineation of a generic substantive structure of "environmental education."

The "environmental education" literature compiled in Chapter II, and synthesized in Chapter III, generally specified that the expected outcome, or goal, of "environmental education" is developing the "environmentally literate citizenry," or "environmental literacy." The researcher accepts that position as far as it goes, but suggests that it is incomplete as an overall goal, or expected outcome, for the substantive structure of "environmental education." This constitutes the fourth instance of inconsistency or incompleteness in the professional literature, as perceived by the researcher.

Based on this contention, the researcher takes the following steps: (1) consideration of what is in the literature relative to expected outcome, particularly literacy;

(2) expansion of the expected outcome concept to include two additional levels, and;

(3) operationalization of each of the levels of expected outcome.

The researcher is taking the position that there are additional levels of expected outcome beyond literacy. He perceives that to concentrate only on literacy levels does an injustice to all phases of the man-environment relationship.

These levels of expected outcome, when fully operationalized, will complete the delineation of the generic substantive structure of "environmental education."

Environmental Literacy

Goals are either stated or implied in much of "environmental education" literature from 1969 to the present (1976), primarily by reference to the development of an "environmentally literate citizenry." Stapp (1969) deals with understanding and concern as two basic goals. The first actual reference to the term "environmentally literate citizenry" identified by the researcher was by Nixon (1970), who specified that a new understanding and awareness are needed. C. Roth (1971) specified that an environmentally literate citizen should be able to read the environment, diagnose its ills, apply first aid, and if needed, call in an expert. Elsewhere in the same paper, Roth stated that awareness, skills and individual responsibility were needed.

Rubin et al. (1974), and Agne and Nash (1974), although using somewhat different terminology, still indicate the basic requirements of an environmentally literate citizenry are awareness and understanding. Childress and Wert (1976) summarize the total situation in the following way: "With few exceptions, environmental education efforts have dealt primarily with developing awareness in students of the problems involved by encouraging better understanding of ecology and the natural environment" (emphasis added).

Hungerford and Peyton (1976) are more concrete than most, dealing with objectives in the areas of cognitive knowledge, cognitive process, and affect. A review of their objectives, using Bloom's (1956) taxonomy, reveals objectives at the application level as well as lower levels.

The point is, most authors have specified, or implied, that awareness and understanding are basic to environmental literacy. This appears to be compatible with the basic concept of literacy itself. Those who have gone beyond are moving into what the researcher perceives to be other, higher levels of expected outcome. In other words, the concept of literacy is simply not inclusive enough to accept the levels of expected outcome necessary for a complete delineation of the substantive structure of "environmental education." The additional levels of expected outcome proposed by the researcher will be operationalized and discussed in the following subsections.

Additional Levels of Expected Outcomes

The three taxonomies of educational objectives used as guides in synthesizing the "environmental education" literature in Chapter III (i.e., Bloom, et al., 1956; Harrow, 1972; and Krathwohl, et al., 1964) were examined in terms of expected outcomes for MERE. The researcher perceived that the environmental literacy components suggested, or implied, by a number of authors (i.e., awareness and understanding) apply to the lower levels of the affective and cognitive domains respectively. Further examination of the levels of each taxonomy, and the types of outcomes expected at each level, brought the researcher to the conclusion that literacy is insufficient as an overall goal or expected outcome for MERE.

Specifically, the researcher perceives two additional levels of expected outcomes within the substantive structure of "environmental education," namely environmental competence and environmental dedication. Each of the three levels is operationalized by definition, and subsequently each will be further operationalized as it applies to each of the three domains: psychomotor, cognitive, and affective.

> Environmentally literate person--one who possesses basic skills, understandings, and feelings for the man-environment relationship.

The environmentally literate person is aware of environmental problems and is knowledgeable about how to go about solving these problems.

> Environmentally competent person--one who is environmentally literate, and in addition, has the ability to apply, analyze, synthesize, and evaluate knowledge; has the skills necessary for implementation; and, has values consistent with the man-environment relationship superordinate goal.

> Environmentally dedicated person--one who is environmentally literate and environmentally competent in the affective domain, and in addition, is characterized by a values system in which one acts consistently in a manner compatible with homeostasis between quality of life and quality of environment. The environmentally dedicated person is inferred to be able to operate at the highest levels of the psychomotor and cognitive domains as well as affective.

Although the "environmentally dedicated" level refers directly only to the affective domain, and no absolute correlation between the domains can be inferred, it appears reasonable to the researcher that such a person would be able to operate at the highest levels of the psychomotor and cognitive domains as well. The description of the 5.2 level in Krathwohl, et al. (1964) does not negate such a possibility, and in fact, the parallel figures of the cognitive domain and affective domain, clearly imply that the highest cognitive level is equivalent to the highest affective level (see Krathwohl, et al., 1964, pp. 49-50).

The remainder of the section will be devoted to further operationalization of these three levels of expected outcome within the substantive structure of "environmental education." Each domain will be treated in a separate subsection, and each level of expected outcome will be considered for each domain: psychomotor, cognitive, and affective.

Expected outcome levels related to the psychomotor domain. The synthesis of "environmental education" literature in Chapter III of this study is perceived by the researcher to show that the psychomotor domain is virtually ignored. This may be due to a heavy emphasis on one of the other domains, a lack of knowledge related to the psychomotor domain, an assumption that such skills will "develop naturally," or some other reasons. Regardless of the reason, the researcher perceives a need to incorporate the psychomotor domain into the substantive structure of "environmental education."

References to literacy generally do not specify what is basic, or a literate level, yet the researcher perceives a dichotomy between the skills that are "basic" and those that imply some "competence." Extrapolating from "awareness" and "understanding," the most often used or implied terms referring to literacy, the researcher has established level

3.0 or perceptual abilities, as the upper limit of literacy. Beginning with level 4.0 or physical abilities, the upper half of the domain is established as competence only; however, the competent person, by definition, is literate in the same domain.

The paradigm (Figure 53) depicts the above prose. Although the environmentally dedicated person is not shown on the paradigm, the implication is that anyone who is able to operate at the highest level of the affective domain would also operate at the upper levels of psychomotor.

Expected outcome levels related to the cognitive domain. Using Bloom's (1956) taxonomy as a model, the term "understanding," which is most commonly used to describe the environmentally literate person, is interpreted by the researcher to be level 2.0 or comprehension. According to the hierarchial nature of the taxonomy, this level cannot be achieved without first reaching the 1.0 level of knowledge. The term environmental literacy, then, is interpreted by the researcher to include levels 1.0 and 2.0 of the cognitive taxonomy.

The environmentally competent person is operationalized as one who is environmentally literate, but in addition can apply, analyze, synthesize and evaluate. That is to say, the environmentally competent person operates at the upper four levels of the taxonomy in addition to the lower two levels. The environmentally competent person operates at level 1.0 (knowledge), level 2.0 (comprehension), level 3.0 (application), level 4.0 (analysis), level 5.0 (synthesis), and level 6.0 (evaluation).

The paradigm (Figure 54) depicts the above prose. Although the environmentally dedicated person is not shown on the paradigm, the implication is that anyone who is able to operate at the highest level

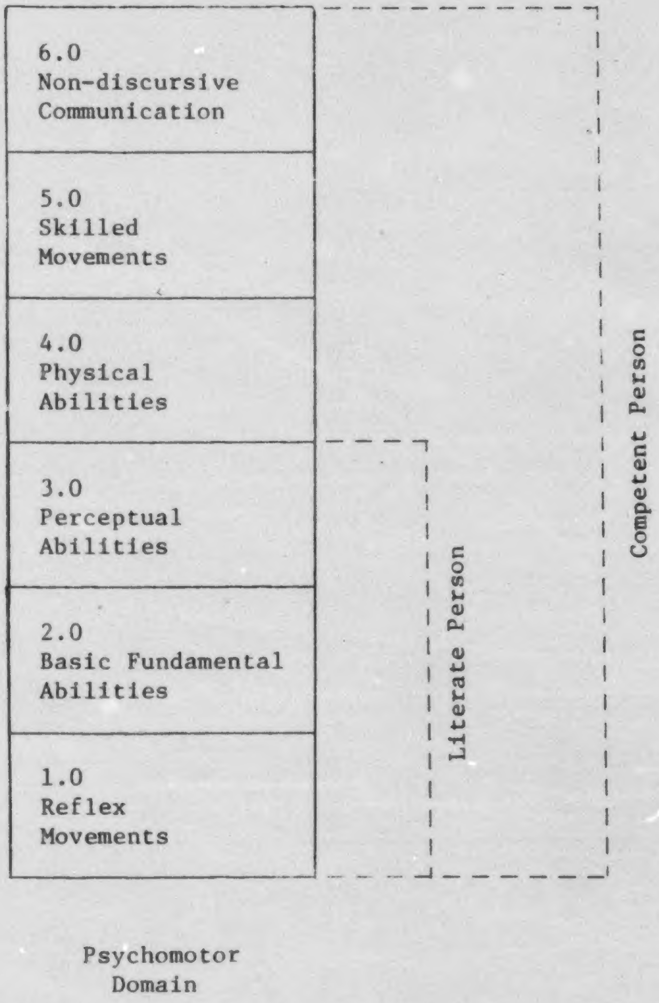

6.0
Non-discursive
Communication
5.0
Skilled
Movements
4.0
Physical
Abilities
3.0
Perceptual
Abilities
2.0
Basic Fundamental
Abilities
1.0
Reflex
Movements
Literate Person
Competent Person
Psychomotor
Domain

Figure 53. Levels of expected outcome relative to the psychomotor domain (Harrow, 1972). This is one of three domains making up the expected outcomes component of the substantive structure of "environmental education."

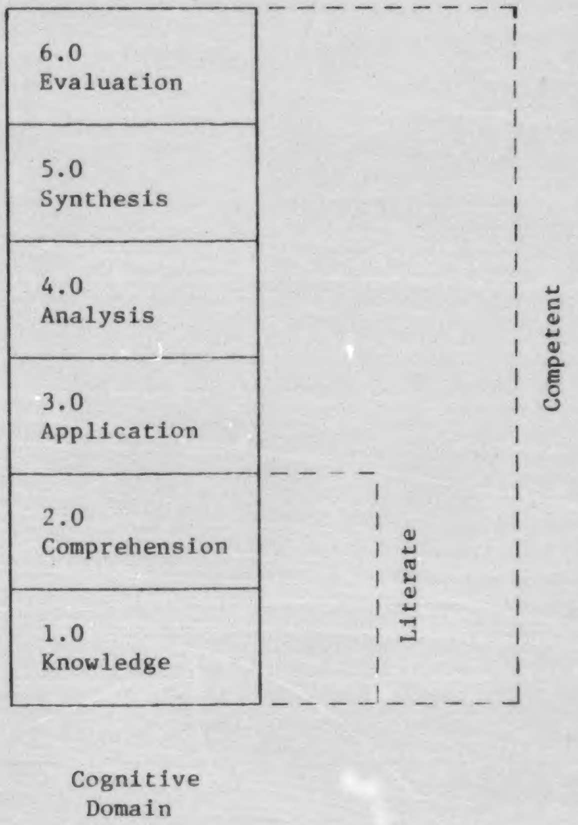

6.0
Evaluation
5.0
Synthesis
4.0
Analysis
3.0
Application
2.0
Comprehension
1.0
Knowledge
Competent
Literate
Cognitive
Domain

Figure 54. Expected outcome levels related to the cognitive domain (Bloom, et al., 1956). This is one of the three domains making up the expected outcomes component of the substantive structure of "environmental education."

of the affective domain would also operate at the upper levels of cognitive.

Expected outcome levels related to the affective domain. In general, the literate person is perceived to be one who has awareness, or level 1.0 (receiving) of the affective domain and 2.0 or responding. The determination of level is according to Krathwohl's (1964) taxonomy related to the affective domain.

The environmentally competent person is one who is environmentally literate, but in addition, operates at levels 3.0 through 5.1 of the affective domain. In effect, the competent person not only is aware, but effectively deals with that awareness, i.e., behaves in a manner beyond the capability of one who is only aware.

The environmentally dedicated person is operationalized as one who is environmentally literate and environmentally competent, but in addition operates effectively at level 5.2. The 5.2 level or characterization by a value system, is a critical element in the consideration of the environmentally dedicated person. That is what differentiates the competent (or skilled) person from one who is dedicated (i.e., committed to a cause), i.e., a person may be skilled and yet not act consistently. A person who has reached the 5.2 level of affect "acts consistently in accordance with the values he has internalized at the level" (Krathwohl, 1964).

Summary

The philosophical base (or first major component) of the substantive structure of "environmental education" is "Spaceship Earth" with the

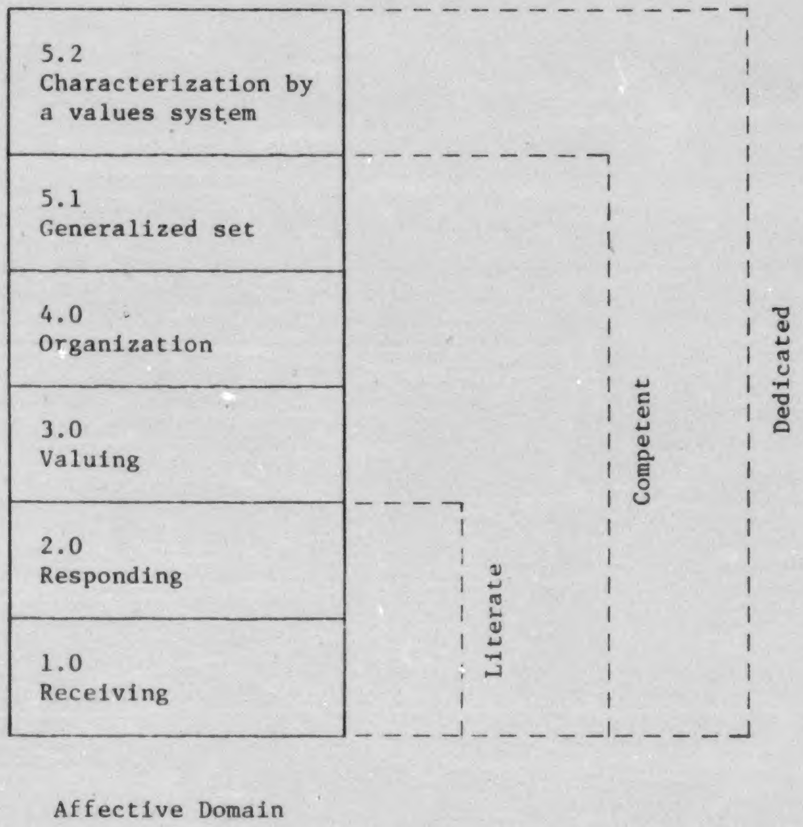
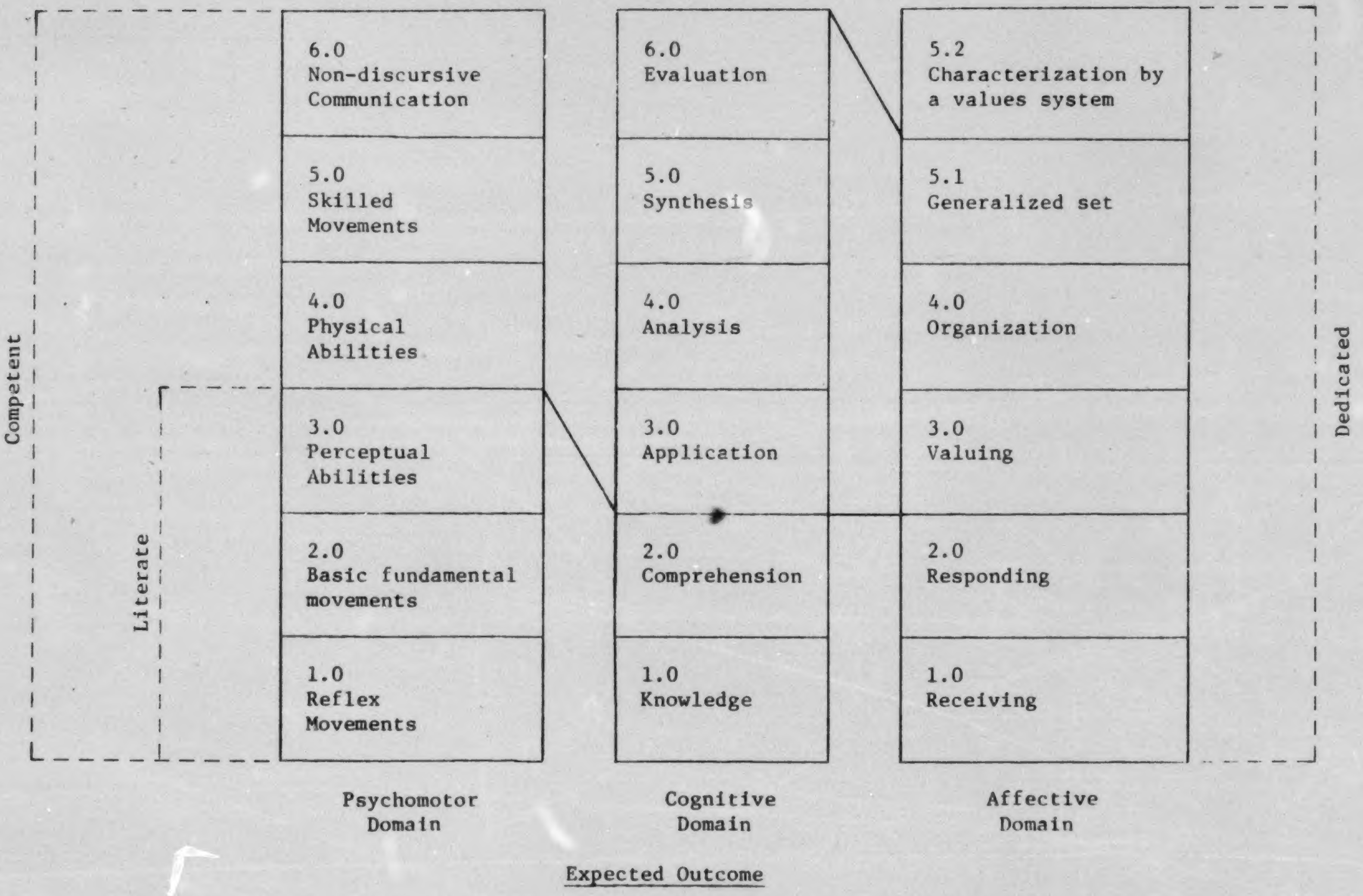

5.2
Characterization by a values system
5.1
Generalized set
4.0
Organization
3.0
Valuing
2.0
Responding
1.0
Receiving
Literate
Competent
Dedicated
Affective Domain

Figure 55. Expected outcome levels related to the affective domain (Krathwohl, et al., 1964). This is one of three domains making up the expected outcomes component of the substantive structure of "environmental education."



Competent
Literate
6.0 Non-discursive Communication
5.0 Skilled Movements
4.0 Physical Abilities
3.0 Perceptual Abilities
2.0 Basic fundamental movements
1.0 Reflex Movements
6.0 Evaluation
5.0 Synthesis
4.0 Analysis
3.0 Application
2.0 Comprehension
1.0 Knowledge
5.2 Characterization by a values system
5.1 Generalized set
4.0 Organization
3.0 Valuing
2.0 Responding
1.0 Receiving
Dedicated
Psychomotor Domain
Cognitive Domain
Affective Domain
Expected Outcome

Figure 56. All levels of expected outcome (the third component of the substantive structure of "environmental education") as they relate to the psychomotor domain (Harrow, 1972), the cognitive domain (Bloom, et al., 1956), and the affective domain (Krathwohl, et al., 1964).

"lifeboat" concept as a frame of reference. "Spaceship Earth" utilizes man, environment, and relationship as major components while the "lifeboat" concept frame of reference provides a values/ethics orientation. This leads to the precept, or second major component of substantive structure.

The precept (man-environment relationship) mandates the remainder, i.e., the specifics, of "environmental education." The man-environment relationship is reflected in both MER education (MERE) and MER foundations (MERF), with a formal values context required for a topic to be MERE.

The third major component of substantive structure of "environmental education" is expected outcome. Expected outcomes are conceptualized in terms of three levels (environmental literacy, environmental competence, and environmental dedication) and operationalized in terms of three "domains" (i.e., psychomotor, cognitive, and affective). These three components, then, (philosophy, precept, and expected outcome) form the generic substantive structure of "environmental education" (MERE). The arrangement of the components is depicted in Figure 57. This represents the researcher's conceptualization of the generic substantive structure of "environmental education."

Three additional components complete the final paradigm in Chapter IV (Figure 58). Two are perceived as indicators of specific substantive structure resulting from the application of the generic substantive structure developed in this study, and the third is the superordinate goal of MER. Consideration of either specific substantive structure component is beyond the scope of this study, therefore the specific substantive structure components in the paradigm serve as "placeholders"

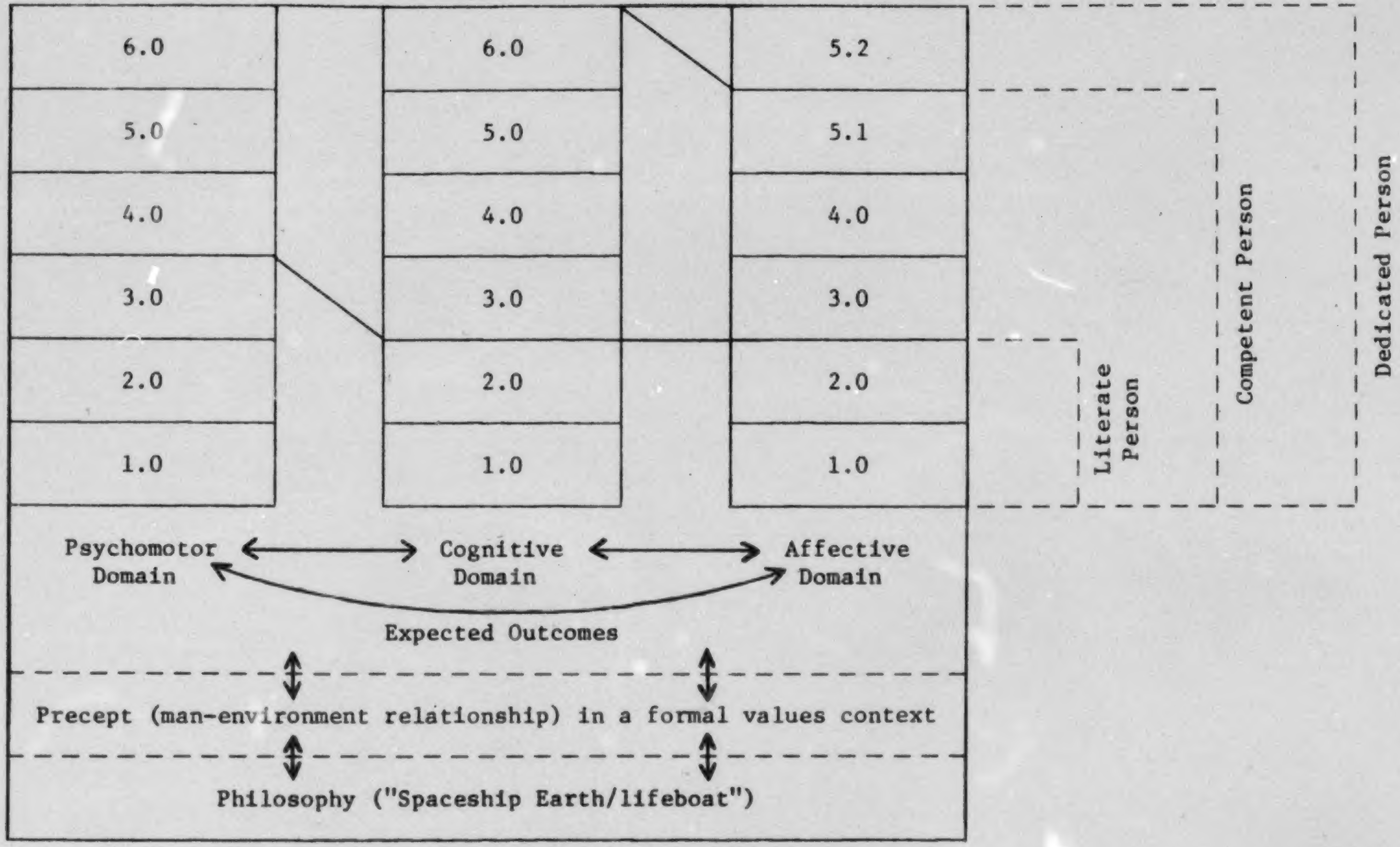

6.0
5.0
4.0
3.0
2.0
1.0
6.0
5.0
4.0
3.0
2.0
1.0
5.2
5.1
4.0
3.0
2.0
1.0
Literate Person
Competent Person
Dedicated Person
Psychomotor Domain
Cognitive Domain
Affective Domain
Expected Outcomes
Precept (man-environment relationship) in a formal values context
Philosophy ("Spaceship Earth/lifeboat")

Figure 57. The arrangement/interaction of the components making up the generic substantive structure of "environmental education."

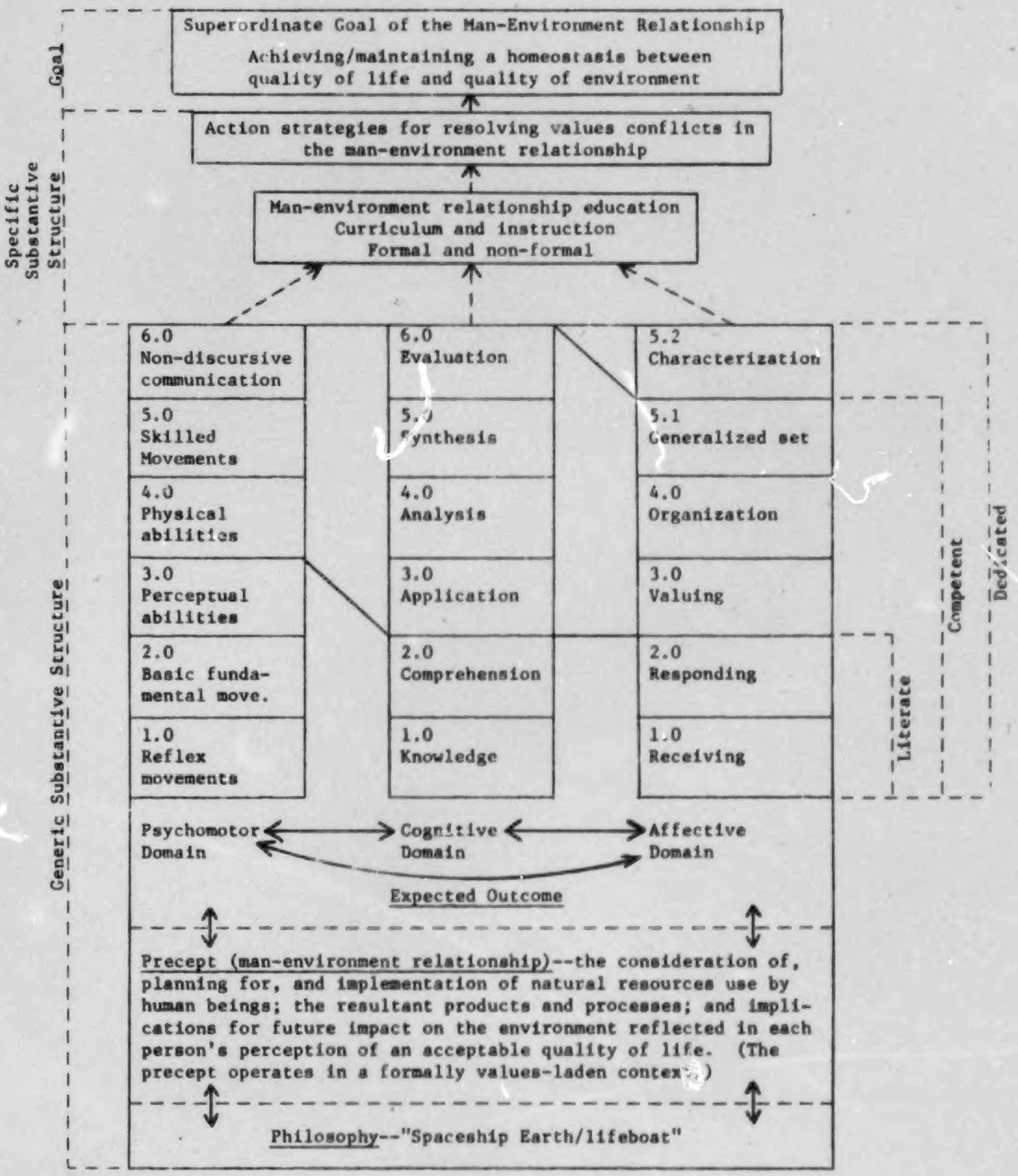

Goal
Specific Substantive Structure
Generic Substantive Structure
Superordinate Goal of the Man-Environment Relationship
Achieving/maintaining a homeostasis between quality of life and quality of environment
Action strategies for resolving values conflicts in the man-environment relationship
Man-environment relationship education
Curriculum and instruction
Formal and non-formal
6.0 Non-discursive communication
5.0 Skilled Movements
4.0 Physical abilities
3.0 Perceptual abilities
2.0 Basic fundamental move.
1.0 Reflex movements
6.0 Evaluation
5.0 Synthesis
4.0 Analysis
3.0 Application
2.0 Comprehension
1.0 Knowledge
5.2 Characterization
5.1 Generalized set
4.0 Organization
3.0 Valuing
2.0 Responding
1.0 Receiving
Literate
Competent
Dedicated
Psychomotor Domain
Cognitive Domain
Affective Domain
Expected Outcome
Precept (man-environment relationship)--the consideration of, planning for, and implementation of natural resources use by human beings; the resultant products and processes; and implications for future impact on the environment reflected in each person's perception of an acceptable quality of life. (The precept operates in a formally values-laden context.)
Philosophy--"Spaceship Earth/lifeboat"

Figure 58. The completed substantive structure of "environmental education."

until they can be handled appropriately in future studies.

The component directly over, and conceptualized as resulting directly from the generic substantive structure, is "MERE curriculum and instruction--formal and non-formal." While the specifics of curriculum and instruction are beyond the scope of the study, the researcher perceives such specifics as a critically important result of the generic substantive structure's application to the educational milieu. Therefore, specific conclusions, implications, and recommendations related to curriculum and instruction are discussed in Chapter V.

The second specific component added as a "placeholder" is "action strategies for resolving values conflicts in the man-environment relationship." These strategies are perceived to be actions taken as a result of the implementation of the formal and non-formal MERE curriculum and instruction. Further, they are perceived to be the "striving" behaviors needed to reach the superordinate goal of a homeostasis between quality of life and quality of environment as specified in the definition of MERE.

The third additional component needed to complete the overall substantive structure of "environmental education" is the superordinate goal of MER, or to "achieve/maintain a homeostasis between quality of life and quality of environment." This is perceived to be the goal towards which all efforts in MERE are ultimately directed. Unlike the "curriculum and instruction" and "action strategies" components, the superordinate goal is not a "placeholder" but an ideal toward which environmentally literate, environmentally competent, and environmental dedicated persons are constantly striving.

The generic substantive structure components, described in depth in

Chapter IV, along with the two "placeholder" specific substantive structure components and the superordinate goal, represent the researcher's conceptualization of the overall substantive structure of "environmental education." Figure 58 depicts this conceptualization.

This completes the answer to research question #4, which was the last research question to be answered. One additional paradigm (Figure 59) is constructed in Chapter V. It utilizes the components in the overall substantive structure (Figure 58) and depicts their interaction with their more general bases.

Chapter V

DISCUSSION OF THE STUDY

Chapter I provides the introduction, research questions, significance and rationale, procedures, assumptions, limitations, and definitions of pertinent terms. It is the foundation for the rest of the study.

Chapter II is the review of the literature. Its major components are history and background, definitions of environmental education, and approaches to delineating the substantive structure of "environmental education" which were found in the literature.

Chapter III is a synthesis of the data compiled in Chapter II related to (1) definitions of environmental education and (2) the substantive structure of "environmental education."

Chapter IV is where the researcher constructs what he perceives to be a complete, educationally sound generic substantive structure of "environmental education."

The remainder of Chapter V, which follows, provides conclusions related to the research questions, ancillary conclusions, implications of the substantive structure and paradigm, and recommendations.

Conclusions Related to the Research Questions

In Chapter I, four research questions were posed which provided the overall guidance for this study. The research questions are reiterated below, and answered:

1. Based on a search of the literature, and other sources, what are the professional perceptions relative to the following: (a) operational definitions of environmental education, and (b) substantive structures for environmental education?

Research question #1 is answered by the data collected and compiled in Chapter II. In that chapter, more than forty definitions and more than one hundred positions on substantive structure are quoted.

2. Based on an analysis of the data compiled from the literature, and other sources, is it possible to identify the following: (a) a generally accepted operational definition of environmental education, and (b) a generally accepted substantive structure of environmental education?

Research question #2 has two parts. The data compiled in Chapter II were analyzed and synthesized in Chapter III. Based on that analysis and synthesis, the researcher concludes: (a) there is no generally accepted definition of "environmental education" available in the professional literature, and (b) there is no generally accepted substantive structure of "environmental education" available in the professional literature.

3. If, in fact, there is no agreement relative to an operational definition of environmental education, can one be constructed which mediates the differences?

Research question #3 was answered in the following manner. Key words and phrases found in the definitions of "environmental education" were tallied. Many of these key words and phrases, or their synonyms, were then used in the construction of a definition of "environmental education." That definition follows:

> Environmental education--an interdisciplinary, integrated educational process concerning the resolution of values conflicts related to the man-environment relationship through

> the development of a citizenry with awareness and understanding of the environment, both natural and man-altered. Further, this citizenry will be able and willing to apply enquiry skills, decision-making, problem-solving, and action strategies toward achieving/maintaining a homeostasis between quality of life and quality of environment.

4. If, in fact, there is no agreement relative to a substantive structure for environmental education, what logical, philosophical constraints can be placed on this field that would permit the formulation of a reasonable, educationally sound substantive structure for environmental education?

Research question #4 was answered in the following manner. Utilizing key words and phrases identified in the definitions, and several other references, key words and phrases were identified in the approaches to substantive structure literature, and were tallied. Based on an evaluation of that data, the researcher concluded that a generic substantive structure of "environmental education" could be constructed utilizing three major components: philosophy, precept, and expected outcome. Each of these components is described in detail in Chapter IV.

Although not necessarily part of the generic substantive structure of "environmental education" per se, a number of ancillary conclusions are drawn by the researcher relative to man-environment relationship education. The following items are not listed in hierarchical order.

Ancillary Conclusions

1. "Spaceship Earth/lifeboat" philosophy is the basis of man-environment relationship education.

2. The precept of the substantive structure, of "environmental education," is the man-environment relationship.

3. Man-environment relationship is defined as

> the consideration of, planning for, and implementation of natural resources use by human beings; the resultant products and processes; and implications for impact on the environment reflected in each person's perception of an acceptable quality of life.

There is no intent on the part of the researcher to construct a values-laden definition, i.e., this definition subsumes all man-environment relationships from outright exploitation through total preservation. Further, man, who is part of the environment, and a resource, is arbitrarily and artificially separated from other resources since he alone of earth's inhabitants can significantly influence "environmental quality" on a global scale.

4. The superordinate goal of man-environment relationship is achieving/maintaining homeostasis between quality of life and quality of environment.

5. The first area of inconsistency or incompleteness perceived in the literature is the inappropriateness of the name "environmental education." The name "man-environment relationship education" (MERE) is offered as a descriptor more consistent with the researcher's conceptualization of the substantive structure of "environmental education."

6. A second area of incompleteness or inconsistency perceived in the literature is a lack of discrimination between man-environment relationship education topics and man-environment relationship foundation topics.

7. Man-environment relationship education (MERE) is defined as follows:

> the process of developing an environmentally literate, competent, and dedicated citizenry which actively strives to resolve values conflicts in the man-environment relationship,

> in a manner which is ecologically and humanistically sound, in order to reach the superordinate goal of homeostasis between quality of life and quality of environment.

To be considered part of MERE, a topic must meet the following two criteria:

a. All three components of the precept (man, environment, and relationship) must be present.

b. A human values component representing different positions relative to a man-environment relationship issue must be present.

8. Man-environment relationship education (MERE) is a much more closely circumscribed field of study than is generally indicated in the literature, i.e., when man-environment relationship foundations (MERF) are included as part of "environmental education."

9. Man-environment relationship foundations (MERF) is defined as a topic which provides learnings (psychomotor, cognitive, or affective) about the man-environment relationship, in a non-values-laden context, which are prerequisite, or complementary, to MERE. MERF can be further broken down into three components. These are:

a. Man-focused foundations are topics which have as a main focus the human being, either individually or collectively.

b. Environment-focused foundations are topics which have as a main focus the biophysical environment and its systems.

c. Relationship-focused foundations are topics which have as their main focus the relationship between humans and the earth, as well as the products/processes resultant from that interaction, but the topic is handled in a non-values-laden manner.

10. Man-environment relationship foundations are basic to man-environment relationship education.

11. The third area of inconsistency or incompleteness perceived in the literature is the lack of discrimination in the use of the terms multidisciplinary and interdisciplinary, as they relate to the area in question.

a. Multidisciplinary is defined by the researcher as components from two or more academic disciplines focused sequentially on a single topic.

b. Interdisciplinary is defined by the researcher as components from two or more academic disciplines focused simultaneously on a single topic.

12. Man-environment relationship education (MERE), as defined by the researcher, is interdisciplinary.

13. Man-environment relationship foundations (MERF), as defined by the researcher, may be disciplinary, multidisciplinary, or even interdisciplinary.

14. The fourth area of inconsistency, or incompleteness, perceived in the literature was the inadequacy of the expected outcome expressed as the development of an environmentally literate citizenry. The researcher perceives the need for two additional levels of expected outcome, namely environmental competence, and environmental dedication. These three levels are defined as follows:

a. The environmentally literate person is defined as one who possesses basic skills, understandings, and feelings for the man-environment relationship. (The environmentally literate person is aware of environmental problems and is knowledgeable about how to go about solving those problems.)

b. The environmentally competent person is defined as one who is environmentally literate, and in addition, has the ability to apply, analyze, synthesize, and evaluate knowledge; has the skills necessary for implementation; and, has values consistent with the man-environment relationship superordinate goal.

c. The environmentally dedicated person is defined as one who is environmentally literate and environmentally competent in the affective domain, and in addition, is characterized by a values system in which one acts consistently in a manner compatible with homeostasis between quality of life and quality of environment. The environmentally dedicated person is inferred to be able to operate at the highest levels of psychomotor and cognitive domains as well as affective.

15. A critical short-coming of "environmental education" is the lack of a solid research base. The researcher perceives such a base as a foundation from which rational decisions can be made.

16. No significant trends or evolutionary processes were perceived by the researcher in his analysis and synthesis of the literature (primarily 1969-1975 with some 1976).

Implications of the Substantive Structure of "Environmental Education" and Paradigm (Figure 58)

1. A sound philosophical base is critical to effective development/implementation/evaluation of MERE. "Spaceship Earth" with a focus on the "lifeboat" concept provides that base and has been designated "Spaceship Earth/lifeboat" philosophy. At first impression, such a melding may seem incongruous; however, the researcher perceives positive results developing from it, including the following:

a. A single, consistent philosophical position may be fully

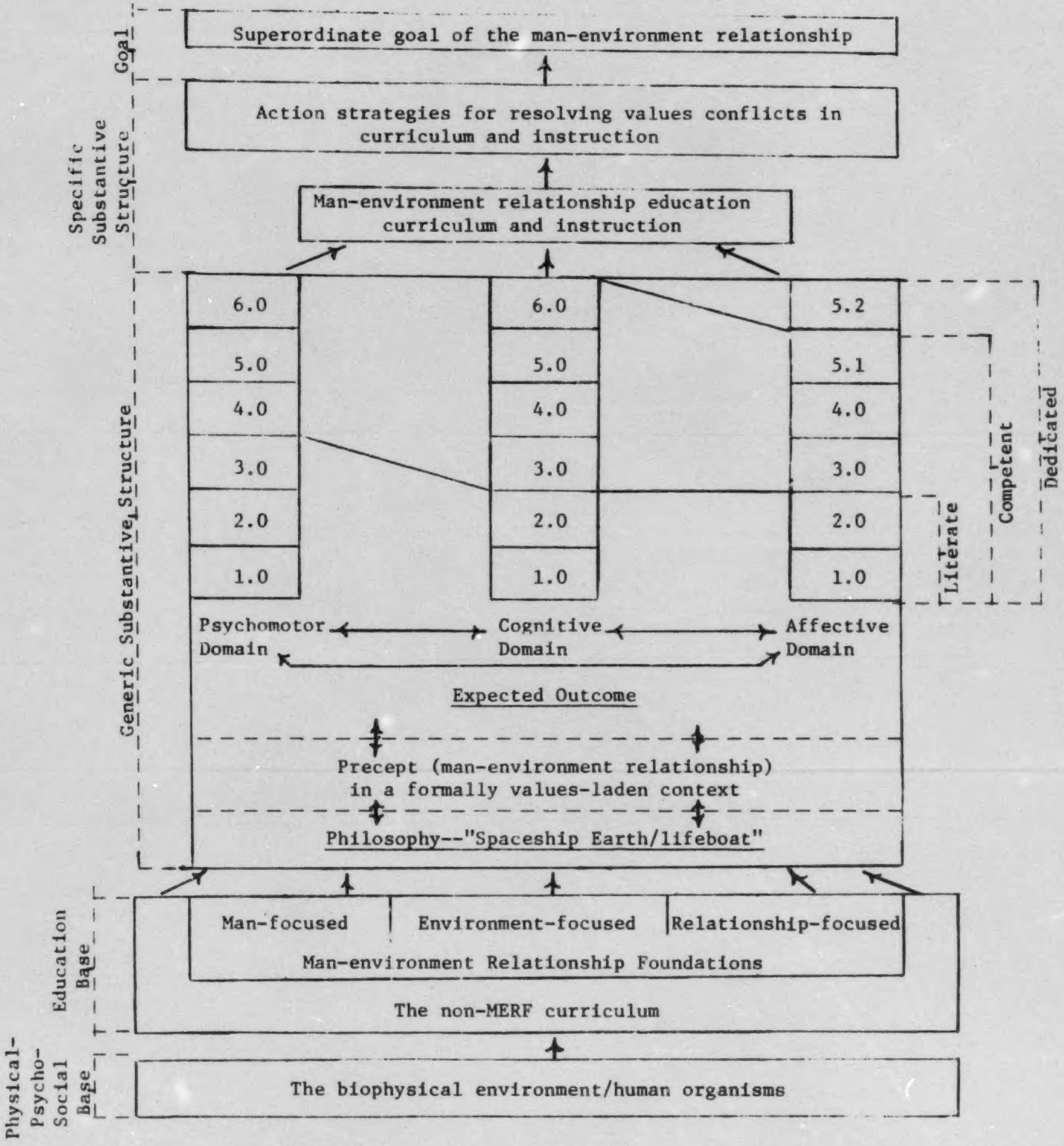

Superordinate goal of the man-environment relationship
Action strategies for resolving values conflicts in curriculum and instruction
Man-environment relationship education curriculum and instruction
6.0
5.0
4.0
3.0
2.0
1.0
6.0
5.0
4.0
3.0
2.0
1.0
5.2
5.1
4.0
3.0
2.0
1.0
Psychomotor Domain
Cognitive Domain
Affective Domain
Expected Outcome
Precept (man-environment relationship) in a formally values-laden context
Philosophy--"Spaceship Earth/lifeboat"
Man-focused
Environment-focused
Relationship-focused
Man-environment Relationship Foundations
The non-MERF curriculum
The biophysical environment/human organisms
Goal
Specific Substantive Structure
Generic Substantive Structure
Education Base
Physical-Psycho-Social Base
Literate
Competent
Dedicated

Figure 59. The substantive structure of "environmental education" with its more general bases.

developed from this incomplete beginning.

b. "Spaceship Earth" is primarily an epistemologically related component, while "lifeboat" is primarily an axiologically related component, therefore, each is more complete with the other.

2. The establishment of the precept (man-environment relationship), when used in conjunction with a values context, provides the major directive force in determining what topics constitute "environmental education." The precept (man-environment relationship) formalizes an essential focus which "environmental education" previously lacked.

3. The superordinate goal of the man-environment relationship is the achievement/maintenance of a homeostasis between quality of life and quality of environment. Neither unbridled implementation of all technology nor a return to the "simple" life appears to be a viable alternative for the entire population. Further, those who advocate one extreme position are probably as unrealistic as those who advocate the other. The goal must be a balance between the extreme positions, i.e,, homeostasis.

4. Three levels of expected outcome (environmental literacy, environmental competence, and environmental dedication) are related to each of the three domains (psychomotor, cognitive, and affective). The hierarchical nature of the taxonomies mandates dealing with the levels of expected outcome sequentially in each domain. Further, it is critical that the uppermost levels of each domain be reached and that persons or programs not become fixed at the lowest, easiest to implement, levels.

5. Changing the name of the area of study from "environmental education" to "man-environment relationship education" provides for:

a. a more accurate designation, based on usage in the literature.

b. a more complete emphasis, i.e., beyond just the environment.

c. a dichotomy between MERE and MERF.

d. a more circumscribed, easier to conceptualize area of study, which has the potential of becoming an "interdisciplinary discipline."

6. Establishing the two criteria for determining which topics are part of man-environment relationship education (MERE) provides concrete means for developing all levels of MERE topics from lessons through a total environmental curriculum. Using the taxonomic levels of the three domains in expected outcome for the sequence, and the precept (man-environment relationship) in a values context as the scope, curricula for man-environment relationship education (MERE) are within reach. In addition to providing a model for developing objectives, concepts, activities, and evaluation items, the taxonomic hierarchies of the three domains (psychomotor, cognitive, and affective) also provide means of analyzing and evaluating the appropriateness of objectives, concepts, activities, and evaluation items.

7. Determining what topics are not man-environment relationship education (MERE), but still related to the man-environment relationship, is possible with the two criteria of MERE and the definition of man-environment relationship foundation (MERF). Man-environment relationship foundations (MERF) are fundamental to effective MERE, but the foundations per se are so extensive and diverse that they are not considered to be part of the substantive structure. Their general descriptions and operational definitions are included to provide direction in curriculum and instruction related to man-environment relationship foundations.

For effective MERE, and the development of environmentally literate, competent, and dedicated persons, the researcher perceives a well-rounded program of MERF as being mandatory. A deficiency, or overemphasis, on any one area, to the detriment of the others, should probably be avoided if the superordinate goal of homeostasis between quality of life and quality of environment is to be reached and maintained.

8. Man-environment relationship education (i.e., "environmental education") is perceived to be an interdisciplinary, values-laden dealing with the man-environment relationship; therefore, suggestions that it is suitable for inclusion at all grade levels and in all subject matter areas are probably overstated. The appropriateness of a given topic could be decided using criteria such as: (1) the goals of the instructional process, (2) the competence of the teacher and learner, and (3) the relationship of the subject to the man-environment relationship.

9. Man-environment relationship foundations (MERF), unlike MERE topics, may, indeed, be applicable at all educational levels and in all subject matter areas. This is perceived by the researcher to be the source of any possible misconception about the inclusiveness of man-environment relationship education (i.e., "environmental education"). The appropriateness of any given MERF topic could be decided using criteria such as: (1) the goals of the instructional process, (2) the competence of the teacher and learner, and (3) the relationship of the MERF topic to the subject.

10. Some individuals will become professionals or "practitioners" in some phase of the man-environment relationship. This will require specialized training within these areas of expertise at the graduate, undergraduate, and perhaps secondary levels. A discussion of the practitioner level is beyond the scope of this study, yet it appears to be an implication which must be actively considered at some time.

11. The researcher perceives two basic patterns for making MERE part of the formal curriculum. Each pattern, with some of its varieties, is discussed briefly:

a. Integration approach, i.e., the MERE components and the "general" content are fused to form a single entity.

(1) total environmental curriculum--the MERE components are the base and the "general" content is fused as appropriate.

(2) environmentally integrated curriculum--the "general" content is the base and the MERE components are fused as appropriate.

b. Topic approach, i.e., the MERE components are essentially self-contained in a separate activity, lesson, unit, course, or sequence of courses.

The integration approach is preferred by the researcher, where possible, but the topic approach is also considered an acceptable pattern. In some situations the topic approach may be the only possible, or even the preferred approach.

The higher the level of MERE involvement, presumably, the more opportunity there is for development of environmental literacy, environmental competence, and environmental dedication. Therefore, the total environment curriculum could be considered the ideal situation. On the pragmatic side, however, the possibility of such a total environmental curriculum seems small at the present time, in most contexts.

The second level of the integration approach, the environmentally integrated curriculum, does appear to be a reasonable alternative. Integration of MERE components (as well as MERF) into the "general" curriculum, where appropriate, provides for dealing with the man-environment relationship in an integrated, interdisciplinary manner.

12. Although instruction is beyond the scope of this study, there are implications for instruction which will be outlined. Instruction can be divided into two parts, i.e., teacher-focused and student-focused. This dichotomy allows for a more refined look at teacher and student roles in a formal education milieu.

a. Teacher-focused activities/procedures include:
   (1) Planning for an effective learning process
   (2) Implementing an effective learning process
   (3) Evaluating the learning process

b. Student-focused activities/strategies could include:
   (1) Awareness building
   (2) Investigation
   (3) Values clarification
   (4) Interaction strategies
   (5) Decision-making
   (6) Problem-solving
   (7) Action

13. Man-environment relationship education (i.e., "environmental education") is concluded to be an interdisciplinary, values-laden process for dealing with the man-environment relationship, suitable for both the formal and non-formal educational milieu, suitable for learners with a wide range of ages and abilities, suitable for integration in a wide range of subjects, drawing foundations from a wide range of subjects, utilizing a wide range of teaching/learning strategies and procedures, utilizing several curricular patterns, and finally, is considered to be a critical factor in reaching the superordinate goal of the man-environment relationship, i.e., homeostasis between quality of life and

quality of environment. Therefore, without effective coordination at all implementation levels the possibility of significant portions of the population becoming environmentally literate, environmentally competent, or environmentally dedicated are remote, at best.

14. Effective implementation of MERE in the formal education milieu depends on the competence levels of teachers/leaders; therefore, pre-service and in-service teacher education, as well as educational opportunities for other leaders, must include MERE and MERF components. Without effectively trained teachers/leaders, the possibilities for reaching the superordinate goal of the man-environment relationship, i.e., homeostasis between quality of life and quality of environment, is quite remote.

15. Man-environment relationship education is one area of study which is dependent on the biophysical environment and human interaction with it. Topics that deal with one component of that relationship or with all components in a non-values-laden context are MERF, but the addition of the other two MER components or a values-laden context, may put the MERF topic into the MERE realm. MERE changes with the manner and context in which a topic is handled, therefore, it is flexible and adaptable. It will, based on the generic substantive structure of "environmental education" proposed by the researcher, continue to be current with the needs of the man-environment relationship as they may change.

Implied in the above paragraph are components which are beyond the scope of the substantive structure per se, but which provide a general base. Specifically, the components are the MERF components, the non-MER curriculum, and the physical-psycho-social base representing the biophysical environment and the human organism.

The MERF components (i.e., man-focused foundations, environment-focused foundations, and relationship-focused foundations) were described in Chapter IV. They are considered to be prerequisite, or complementary, to MERE. An analogy to the relationship between MERE and MERF is the relationship between cognitive and affective domains. For planning, research, or discussion purposes, they are separated and conceptualized as separate entities, yet in practice each is greatly affected by the other.

The non-MER curriculum refers to processes, skills, and content which do not relate directly to MER, e.g., reading comprehension, computational skills, grammar skills, and so forth. These non-MER topics can become MERF, or even contribute to MERE, if handled in the proper context. For example, reading comprehension could be taught using MER related content. Computational skills could be taught using MER examples. Grammar skills could be taught using content related to MER. As indicated earlier in the study, it is not the content or the skill per se that determines relationship to MERF or MERE, but the manner of handling and context.

The physical-psycho-social base represents the biophysical environment that exists and its impact on the human organism; and, it represents the "nature" of the human organism, or "human nature," and its impact on the biophysical environment. In this context, the "environment" and "human organism" are considered in the most generic sense of, this is what exists, therefore, the ramifications of that existence must be handled as effectively as possible for both "environment" and "human organism." The researcher perceives the substantive structure of "environmental education" developed in this study to be a beginning step toward a set of overall guidelines for effectively dealing with the relationship between "environment" and the "human organism."

The bases described in the above prose are depicted in Figure 59 as they relate to the substantive structure of "environmental education" developed in Chapter IV of this study.

Recommendations

The researcher perceives reaching/maintaining the superordinate goal of MER to be of utmost importance for the continued survival of the human race with a "reasonable" quality of life. Further, he perceives MERE as the most appropriate means for achieving that goal. He therefore recommends that the substantive structure of "environmental education" developed in this study be applied to the planning, development, implementation, and evaluation of formal and nonformal education at all levels.

The approach to the study is philosophical and theoretical, yet the results should be of practical concern. The researcher feels strongly that the value of a research project such as this lies in the potential for positive major changes it can bring to theory and practice. Further, he contends that to attempt anything less, particularly at the doctoral level, is to engage in an academic exercise which results in superfluous behavior.

1. Because of this concern for the practical application of the conceptualizations, the researcher recommends that the substantive structure and related components be rewritten, in lay terminology, and expanded with appropriate examples and application components. Such a

revision would geared to the general public as well as educational practitioners.

A formal academic document such as a dissertation is written in formal academic language. The researcher speculates that this language barrier may be a factor in the perceived lack of application of research findings to practice. That is to say, implementation will not take place unless the conceptualizations of research are read and understood by practitioners as well as theoreticians. The researcher perceives that such a revision into a more "popular" version, with applications and elements of the specific substantive structure included, will enhance the opportunity for application of the substantive structure and related components to planning, development, implementation, and evaluation.

2. The terms "man-environment relationship--MER," "man-environment relationship education--MERE," and "man-environment relationship foundations--MERF," have been used extensively in this study, and for the sake of consistency, will continue to be used throughout the remainder of Chapter V. This terminology was adopted in order to maintain consistency with usage in the literature, i.e., the number of times "man-environment relationship" appeared in definitions and approaches to delineating the substantive structure of "environmental education."

The researcher recommends the use of parallel terminology in the following form: in each instance, "people" will be substituted for "man." This gives "people-environment relationship" or "PER;" "people-environment relationship education" or "PERE;" and "people-environment relationship foundations" or "PERF." This parallel terminology is consistent with current usage and changing vocabulary patterns.

3. The researcher perceives the teacher to be one of, if not the

most, critical factors influencing the quantity and quality of learning taking place in the formal education milieu. Based on that perception, the researcher recommends that pre-service and in-service teacher education should include MERF topics of all three types, MERE curriculum and instruction, and guided opportunities to practice MERE.

The goal should be two part: (1) to develop teachers who are personally environmentally literate, competent and dedicated; and (2) to develop teachers who will assist their students to become environmentally literate, competent, and dedicated persons who will act consistently in a manner compatible with the superordinate goal of the man-environment relationship. The primary measure of success for teacher education programs is the levels of expected outcomes reached by the students of these teachers.

4. "Environmental education" (MERE) is participated in at many levels by a wide variety of individuals, organizations, and agencies, each with their own point of view. This situation exists, therefore, the researcher recommends that all MERE efforts be coordinated, at least up to the state level. The goals of this proposed coordination probably should include the following: insure many points of view are available on a given issue; reduce overlap of staff, material development, and programs; insure maximum breadth and depth in all programs; identify areas of neglect and arrange for their inclusion; research MERE to determine the effectiveness of strategies, programs, materials, and so forth; insure effective communication among theoreticians, practitioners, students, and the public; and generally to increase the quantity and improve the quality of MERE, striving toward the superordinate goal of MER.

5. The lack of a solid research base in "environmental education" is perceived by the researcher to be a serious shortcoming. A solid research base should form the theoretical and practical foundation upon which programs are built, yet for "environmental education," it is not there. Even more critical is the inconsistent quality of the research that is available and its uncoordinated nature. Perhaps most critical, in terms of long range development and evolution of "environmental education" (MERE), is the apparent lack of communication between researcher and practitioner. Based on this perspective, the researcher recommends the following:

a. Establish and maintain a communications network between researcher and practitioner beyond the current journals available in the field.

b. Use the substantive structure and paradigm to guide and coordinate research, and use the results of that research to validate the substantive structure and paradigms. Modify the substantive structure and paradigms as necessary based on valid research.

c. Study each of the implications and recommendations, where appropriate, in a realistic situation. Such a coordinated research project would eventually result in a substantial base of research findings.

d. Apply the substantive structure and paradigm, or an appropriately modified version thereof, to the analysis and synthesis of extant research in "environmental education." This would permit research to be grouped logically and pinpoint areas of needed research as well as areas extensively studied. This synthesis should be published and updated from time to time.

e. Several general areas appear to be in need of research, including the following: the philosophical position; the possibility of additional "domains" such as action or communication; formal patterns of implementation; non-formal patterns of implementation; patterns of administration; pre-service/in-service teacher education; "practitioner" education; patterns of college/university involvement; patterns of coordination; patterns of communication; the possibility of MERE becoming an "interdisciplinary discipline;" and possibilities of regional, national, and/or international coordination and cooperation.

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